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JUN 13 1914

THE HEATING AND VENTILATING MAGAZINE

Vol. XI. No. 6.
$1.00 a year. 10 cents a copy

NEW YORK, JUNE, 1914

Publication Office:
1123 Broadway, New York

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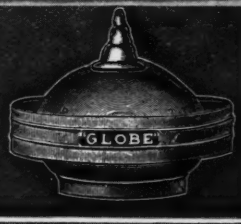

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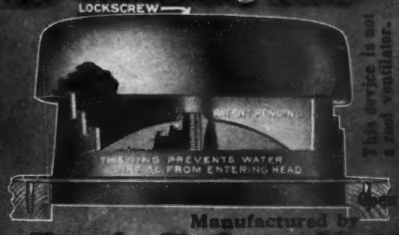

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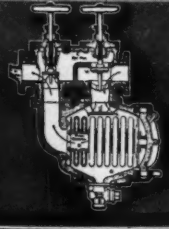

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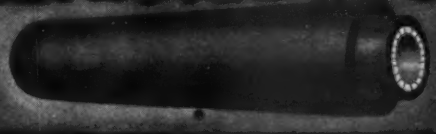

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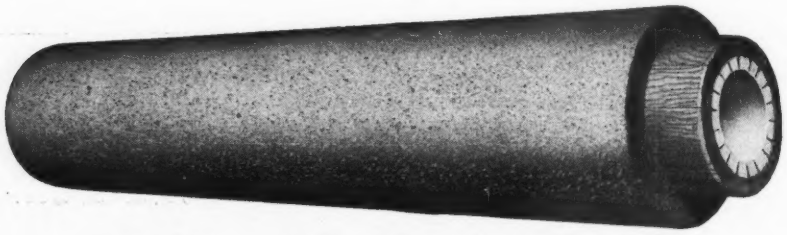

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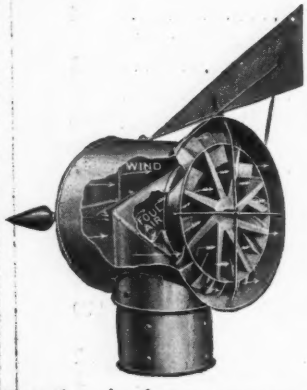

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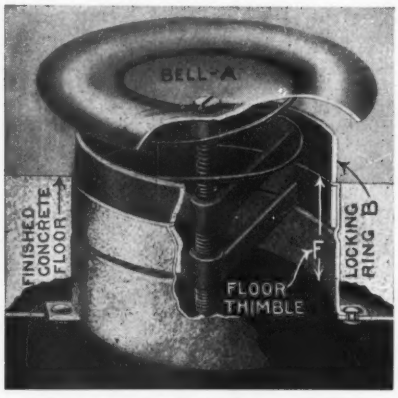

The BI-Cal-Ky Mushroom Vent Cap and Floor Thimble Used in Floors with Fan System in Theatres, Schools, Churches and Public Buildings

is far superior to any other cap and thimble on the market in simplicity, appearance and efficiency, as well as low in price.

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Note projection of cap which deflects the air towards the floor, thereby eliminating draughts. Compare with other caps.

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1914

1904-1914

A BUSINESS career of ten years does not always mean much in these strenuous days but when it comes to the development of a magazine, and especially one devoted to the engineering side of a profession, such a journal may easily acquire in that space of time a personality all its own, making it an object of interest, friendship and even loyalty on the part of those who have closely followed its fortunes.

Such sentiments as these animate the publishers of THE HEATING AND VENTILATING MAGAZINE as they celebrate with this issue the magazine's Tenth Birthday Anniversary. Only those who have borne the heat and burden of the day can appreciate the extent to which the magazine's personality has impressed itself upon their minds and consciousness. To them it has become a living thing whose standards and ideals have taken form and may not be treated lightly or lowered. Its years of coddling and nurturing might well be compared to those of the small but sturdy youngster, albeit with the difference that its maturity has been reached in less than half the allotted time of youth.

And now, as we stand on the higher reaches and look back, we live over again the magazine's early struggles, always toward success, but with their full share of ups and downs.

It was an enthusiastic and hopeful, yet daring, group of men who made possible the founding of THE HEATING AND VENTILATING MAGAZINE and, even yet, many of their names stand, as they did then, in the very forefront of their profession, while others have retired from the heating trade, and two of their number have passed on to the Great Beyond. This is the roll of the magazine's original stockholders:

*Wiltsie F. Wolfe, Fowler & Wolfe Mfg. Co., Philadelphia, Pa.
C. B. J. Snyder, Architect and Superintendent of Buildings, Department of Education, New York.
Henry L. Hall, New York Steam Fitting Co., New York.
W. M. Mackay, Mackay Mfg. Co., New York.
Prof. R. C. Carpenter, Cornell University, Ithaca, N. Y.
Harrie D. Crane, W. H. Crane Estate, Cincinnati, O.
Francis A. Williams, Blake & Williams, New York.
Warren Webster, Warren Webster & Co., Camden, N. J.
*James E. Heg, Paul Steam System Co., Chicago, Ill.
Prof. J. H. Kinealy, St. Louis, Mo.
Clarence V. Kellogg, Kellogg-Mackay Co., Chicago, Ill.
B. H. Carpenter, B. G. Carpenter Co., Wilkes-Barre, Pa.
Elias D. Smith, Baker, Smith & Co., New York.
Alfred E. Kenrick, Kenrick Bros., Brookline, Mass.
Albert A. Cryer, Paul Steam System Co., New York.

The first issue, under the editorship of H. A. Smith, made its appearance in June, 1904, at the convention of the National Association of Master Steam and Hot Water Fitters, at Atlantic City. The writer well recalls being handed a copy of the "new baby" on that occasion and noting its neat and attractive appearance. Its future then lay all before it and none knew better than its promoters the long and difficult road it must travel to reach the goal of permanent success.

In February, 1905, H. A. Smith resigned as editor and his place was taken by A. S. Armagnac, who was already known to the heating trade through his connection with the National Association of Master Steam and Hot Water Fitters as managing editor of the *Official Bulletin*. By that time the purpose of the founders was in the way of being fulfilled and, as their interests were only indirectly connected with the magazine, their gradual withdrawal was effected by the sale of their holdings to Mr. Armagnac.

By November, 1908, all of the original stockholders had retired from the company and in that month, Gustave Petersen, of New York, became an equal joint owner, with Mr. Armagnac, of the outstanding stock. Mr. Armagnac was thereupon made president and Mr. Petersen was made treasurer-secretary and business manager. Mr. Petersen's experience in the advertising field admirably equipped him for his

---

*Deceased.

duties in the further development of THE HEATING AND VENTILATING MAGAZINE, which, coupled with the previous work of Mr. Armagnac in the editorial and publishing line, made a combination that was soon reflected in the magazine's gradual but steady advance.

While the magazine has always maintained the same size, it is worthy of note that its first issue contained but 52 pages. At the time the present owners took control, the magazine boasted of but 56 pages. The expansion, however, continued until now the regular issues contain at least 84 pages, while it will be noted that this Tenth Anniversary Number contains no less than 148 pages, making it by far the largest issue ever printed.

It would be entirely unfitting to close these brief reminiscences without referring to the splendid support rendered by readers and advertisers alike in placing the magazine in its present enviable position. The loyalty of its many friends, when friends were most needed, is a tribute not alone to their whole-souled interest in the magazine's success, but also to their spirit of broad-mindedness which enabled them to look beyond their immediate horizon and see the possibilities of this new Force in the heating field.

We would also say a word in appreciation of the kindly feelings and encouragement often tendered to THE HEATING AND VENTILATING MAGAZINE by its contemporaries—*Engineering Review, The Metal Worker, Domestic Engineering* and *Plumbers' Trade Journal,* and now we may pass on such sentiments, as we do most cordially, to the younger journals, *The Merchant Plumber and Fitter* and *Sheet Metal.* It is a fine thing that a spirit such as has animated our contemporaries can be felt and expressed so generously. It is a pleasure as well as a duty to record here our appreciation of their kindly consideration and co-operation.

We shall not speak here of the future, but that it holds good things for us all and for the trade we represent cannot be doubted. That we may be worthy of our trust and that as a profession we may all go forward together, will be our earnest wish and endeavor.

ANNIVERSARY GREETINGS

How the years go by! It seems such a short time since your magazine made its bow to the public, and now you are planning to celebrate your "tin wedding," the Tenth Anniversary of its founding.

I have been so little in direct touch with the development of heating and ventilating during this period of time, having been on the retired list for a number of years, that I fear I could add nothing to the history of this special line of work, but I do tender my hearty congratulations at the success of your publication, and the pleasure it gives your readers as it appears regularly from time to time. With best wishes,

Yours very truly,

Elias D. Smith

Elizabeth, N. J., June, 1914.

Please allow me to take this opportunity to congratulate you upon having made THE HEATING AND VENTILATING MAGAZINE so far successful as to reach its tenth anniversary.

I think that you have carried out the ideas of the founders that the Magazine should be of real service to those engaged in the designing and installation of heating and ventilating and similar work.

Under your able management it has practically reached a point where it can be considered as an up-to-date text book as well as a general handbook of information.

With best wishes for continued success, I remain,

Yours very truly,

Department of Education, New York, June, 1914.

It gives me great pleasure to be able to extend my congratulations to you for having so successfully carried out the enterprise which was started by the publication of THE HEATING AND VENTILATING MAGAZINE ten years ago. You have developed the paper from a condition of trade journalism to the higher plane of engineering, and for that reason your publication has been of great utility to every heating and ventilating engineer.

I think your magazine has had a great deal to do with the development of heating and ventilating during the past ten years. This art has received the best efforts of many eminent engineers and has as a consequence been greatly improved during the past ten years. The improvement probably has been greater in the scientific methods of design than in the more practical mechanical application.

Again extending to you my congratulations, I am,

Yours very truly,

R. C. Carpenter

Cornell University, Ithaca, N. Y., June, 1914.

On this, the tenth anniversary of the founding of your publication, I wish to congratulate you on the high standard of excellence to which you have attained.

While traveling in Europe ten years ago with a prominent English heating and ventilating engineer, he expressed himself strongly to me on the fact that the only publication at that time devoted to our profession in America, should have lost its name and identity by attempting to cover too many lines. He thought that the United States was large enough to support an exclusive publication in our line.

I mentioned this to a few men prominent in our profession on my return and your publication was the result. I am pleased to have had a part in its formation, as I feel that it ably fills an exclusive position.

May it always merit the commendation of the profession and have many years of continued success and improvement.

Yours very truly,

W. M. Mackay

New York, June, 1914.

TEN YEARS OF PROGRESS.

As one of the original stockholders of THE HEATING AND VENTILATING MAGAZINE, and therefore as one of those to whom may be laid the blame or given the credit for launching the magazine on its career, I am glad of this opportunity to congratulate you upon the position which the magazine now occupies in the engineering world. Ten years ago, when the project of establishing a heating and ventilating magazine was first considered there were grave doubts as to whether or not it could make for itself a place in the heating and ventilating world. After considering carefully all the pros and cons the promoters of the magazine thought that they did see a field of future usefulness for it, and, imbued with a high spirit of optimism, they finally launched the magazine upon its career. Guided by careful and skilled hands the magazine grew and prospered, and any one desiring to notice the growth and development of the art of heating and ventilating during the last ten years has but to refer to the copies of THE HEATING AND VENTILATING MAGAZINE. In the pages of the magazine one may trace very readily the progress that has been made and the changes that have come about in the art of the heating and ventilating, since the pages of the magazine set forth the new things in the way of processes and the new devices which have been invented and come into use.

Ten years ago vacuum heating had already reached a high state of development and use, but its fullest development and growth was impeded because the art was dominated by certain patents which were considered basic and which were alive and in force. Now, with the possible exception of one, all of these dominating patents have expired and there are many different vacuum systems on the market, each depending upon its own peculiarities of devices for its own special recognition from the public.

Ten years ago there were not in use any all metal expansion members similar to and serving the same purpose as diaphragms, which could be used where a material or considerable movement was necessary. Thus there were no all metal damper regulators and probably no hint even of such things, but now not only are there expansible members made of metal which may be used in connection with damper regulators, but these members are made of various sizes and are rapidly coming into use for other purposes.

When THE HEATING AND VENTILATING MAGAZINE was start-

ed ten years ago there was, I think, but one State in which there were any laws or regulations providing for adequate or even any degree of ventilation in schools and other buildings, but now there are several States in which the ventilation of schools, theatres, and other buildings is compulsory, and in nearly all of these States the required ventilation is what almost any one would consider as adequate. Not only has the demand for ventilation in buildings become almost universal, but in almost all the large cities of the country there is now a persistent demand for the proper ventilating, as well as the proper heating, of street cars. This demand for ventilation in connection with heating has brought about certain changes in the devices used in heating and ventilating plants; thus the multivane fan, having a large number of vanes, each of which is short radially, has almost displaced the older type of fan in which there was used only eight to twelve blades, each of which had a length of about 30 per cent. of the radius of the wheel.

With the increase in the demand for ventilation there came an increase in the use of the apparatus that would supply heat while supplying, at the same time, air for ventilation, and this brought about a change in the type of heater used in connection with fan systems of heating. It was found possible to make a cast-iron heater unit that could be fastened by means of suitable nipples to other similar units in such a way as to make a heater section that could be used with the same degree of efficiency and effect as the older sections made by screwing pipe into a cast-iron base. This newer cast-iron section possessed many commendable features so that its use grew as soon as it was introduced, and it has continued to be used more and more, until now it is established and is used very extensively.

Only a short time prior to the birth of THE HEATING AND VENTILATING MAGAZINE the people had awakened to the fact that it might be possible not only to provide ventilation for buildings without the necessity of having open windows through which dirt and dust might be blown into the buildings, but that there could also be provided some means for excluding dirt and dust which always carried with it more or less pathogenic germs, and there came a demand for the air supplied to buildings to be cleaned and purified. This demand, in due time, was heard by the heating and ventilating engineers, and they devised and put on the market air washing and purifying apparatus. The use of this apparatus has grown with leaps and

bounds, until now there is scarcely a building in which there isn't installed a ventilating apparatus that does not have also an apparatus for washing and purifying the air before it is discharged into the building. Following the demand for washing and purifying the air used for ventilating there came a demand on the part of the people, made at the instigation of physicians and hygienists, that not only should the temperature of the air in the rooms should be controlled so as to be maintained at any desired degree, but also that the humidity of the air in the rooms should be controlled so as to be maintained within certain limits.

Long prior to the demand on the part of the people for washed, pure air to be supplied to ventilated buildings, engineers and inventors had devised machines and apparatus whereby dust and dirt could be drawn from rugs and carpets of a room and be discharged outside of the room, but there was no great demand for these devices until after engineers had succeeded in supplying pure, clean air to buildings, so that the buildings could be ventilated even when the windows were closed. This meant, of course, that, since the windows were closed, no dirt or dust was blown into the rooms through open windows, and, since the air supplied for ventilation was clean and pure, the air was not contaminated by dust or dirt brought in unless this dirt or dust was brought in by occupants and by them deposited upon the rugs, carpets and other floor coverings. Then people demanded that instead of sweeping or cleaning the rooms in such a way as to stir up the dust and dirt and impregnate the air of the rooms with it, this dirt and dust should be removed by some system of cleaning whereby contamination of the air would be avoided, and this led to a demand for vacuum cleaners, which has grown by leaps and bounds, and which has led to the use of apparatus which is closely allied to heating and ventilating apparatus, in that it all has for its object the improvement of the hygienic conditions of the buildings in which we live and work. While vacuum cleaning apparatus of a practical character had been devised long prior to the birth of THE HEATING AND VENTILATING MAGAZINE, its use had not become common, but during the short life of the magazine the demand for vacuum cleaning apparatus has become so great as to be almost universal.

Prior to the birth of THE HEATING AND VENTILATING MAGAZINE, packless valves for radiators were almost unknown, and it was difficult to keep heating systems free from air, since it almost always leaked into the systems through the packing

around the valve stems, but now packless radiator valves are in common, every-day use, and it is no trick at all to prevent the entrance of air into heating systems. This means, of course, that the vacuum creating devices do not have as much work to do in order to keep free from air those systems equipped with packless valves.

These are some of the most striking things which one may notice in the development of the art of heating and ventilation as set forth in the pages of the sturdy little ten-year-old that started life almost as a foundling, but which, under your efficient, fostering care, has grown to be a quiet, unobtrusive, but strong, force for all that is good in the heating and ventilating world.

That the development of the art of heating and ventilating will continue and grow, always for the betterment of hygienic conditions is certain, and I have faith that in the future, as in the past, the history of this development may be traced in the pages of THE HEATING AND VENTILATING MAGAZINE.

Yours very truly,

J. R. Kinealy.

St. Louis, Mo., June, 1914.

Forms for Heating and Ventilating Work

A System for the Use of the Designing and Contracting Departments.

Of the various system devised to facilitate the work of the heating and ventilating designing engineer and contractor, one of the most complete is that in use in the office of the Charles L. Pillsbury Co., Minneapolis, Minn. Through the courtesy of this company we are enabled to present herewith copies of the forms used both in its designing and contracting departments, with an explanation of their uses.

Figs. 1, 2 and 3 are the blanks used in the designing department and are self-explanatory. In the case of the "heating schedule sheet," spaces are provided for the separate figures on each room, including all the necessary data. The "fan system" schedule blank is equally complete, both sides of the sheet being used, the fan and duct system figures occupying one side and the room data, the other. These forms are supplemented by the "daily time and expense report" blank, which, when properly filled, gives the costs incurred in the drafting room and office for the preliminary work in the laying out of the job.

SHOP FORMS.

As each new job comes into the office, a "work order sheet" (Fig. 4) is filled out which gives all the necessary information with regard to the agreements, changes, etc., in connection with same. Work on the job then progresses, instructions being given to the draftsman through the medium of the "internal order and suggestion sheet" (Fig. 5). When the time comes for a report on internal orders and suggestions an "internal report" blank (Fig. 6) is available for making such a report.

After the contracts are let, the superintendent in charge of the construction of the building is provided with pads of the "weekly progress report" sheets (Fig. 7) which are filled out at the end of each week and turned in to the engineer's office. In this way very close tab is kept on the condition of the work at all times, also on materials on the job, materials required, etc.

When payments are to be made, an inspection of the work is made by one of the engineers from the office and an "inspection report" blank (Fig. 8) filled out and turned in. This "inspection report" states in each case the amount of the estimate to be allowed. The "internal report" blanks are used in connection with reports made by one of the engineers with regard to any matters which he may have to report on.

All internal orders of any nature whatever between members of the force are made out on "internal order and suggestion" sheets (Fig. 5). Letters pertaining to various phases of the work carried on in the office are attached to a "data correspondence" sheet directed to the proper party. After being filled out by that party they are returned to the secretary for answer. A form is also shown (Fig. 9) suitable for use in certifying the amount of work done, coupled with a statement of account. This sheet as well as Figs. 5, 6, 7 and 8 are punched for binding in a loose leaf binder.

All of the sheets here shown, with the exception of the "daily time and expense report" blank are of the uniform size of 8½x11 in., thus conforming to the latest standard for this kind of printed matter. The "daily time and expense report" blank is 11 in x 7¼ in.

HEATING SCHEDULE

CHARLES L. PILLSBURY
CONSULTING ENGINEER

Building ..... Order Number .....
Calculations By ..... Based on Outside Temperature of ..... Date .....
Checked By ..... O.K. .....

Floor ..... Room Name ..... Use of Room ..... Our Room No. .....
Method of Heating ..... Type of Radiation ..... Temperature Required .....
Method of Ventilation .....

Dimensions of Room ..... C. C. .....
Windows No. and Size ..... Single or Double ..... Total sq. ft. Glass .....
Dimensions Exposed Wall ..... Construction of Walls .....
Thickness of Wall ..... Exposed Wall sq. ft. .....
Roof Construction ..... Sq. ft. Roof Exposure .....

Wall less Glass sq. ft.	×	=	B.T.U.	Amount Radiation $\frac{A}{B}$ =	Sq. Ft.
" " " "	×	=	"	Check G+W−G+C.C. =	"
Glass sq. ft.	×	=	"	Taken as Basis =	"
Roof "	×	=	"	Add for Exp. % =	"
"	×	=	"	" " —	"
Air Change	×	=	"	Deduct for % =	"
A=Total B. T. U. Loss	=		"	Total Final Radiation =	"
B=B. T. U. per sq. ft. Radiation	=		"	Amount Specified =	"

Floor ..... Room Name ..... Use of Room ..... Our Room No. .....
Method of Heating ..... Type of Radiation ..... Temperature Required .....
Method of Ventilation .....

Dimensions of Room ..... C. C. .....
Windows No. and Size ..... Single or Double ..... Total sq. ft. Glass .....
Dimensions Exposed Wall ..... Construction of Walls .....
Thickness of Wall ..... Exposed Wall sq. ft. .....
Roof Construction ..... Sq. ft. Roof Exposure .....

Wall less Glass sq. ft.	×	=	B.T.U.	Amount Radiation $\frac{A}{B}$ =	Sq. Ft.
" " " "	×	=	"	Check G+W−G+C.C. =	"
Glass sq. ft.	×	=	"	Taken as Basis =	"
Roof "	×	=	"	Add for Exp. % =	"
"	×	=	"	" " —	"
Air Change	×	=	"	Deduct for % =	"
A=Total B. T. U. Loss	=		"	Total Final Radiation =	"
B=B. T. U. per sq. ft. Radiation	=		"	Amount Specified =	"

Floor ..... Room Name ..... Use of Room ..... Our Room No. .....
Method of Heating ..... Type of Radiation ..... Temperature Required .....
Method of Ventilation .....

Dimensions of Room ..... C. C. .....
Windows No. and Size ..... Single or Double ..... Total sq. ft. Glass .....
Dimensions Exposed Wall ..... Construction of Walls .....
Thickness of Wall ..... Exposed Wall sq. ft. .....
Roof Construction ..... Sq. ft. Roof Exposure .....

Wall less Glass sq. ft.	×	=	B.T.U.	Amount Radiation $\frac{A}{B}$ =	Sq. Ft.
" " " "	×	=	"	Check G+W−G+C.C. =	"
Glass sq. ft.	×	=	"	Taken as Basis =	"
Roof "	×	=	"	Add for Exp. % =	"
"	×	=	"	" " —	"
Air Change	×	=	"	Deduct for % =	"
A=Total B. T. U. Loss	=		"	Total Final Radiation =	"
B=B. T. U. per sq. ft. Radiation	=		"	Amount Specified =	"

FIG. 1.—HEATING SCHEDULE SHEET.

FAN SYSTEM SCHEDULE

Date _____ 191__ **CHARLES L. PILLSBURY** CONSULTING ENGINEER Order No. _____

Building _____ Outside Temp. as Basis _____

No. of Fan Systems in Building _____ Designated by Letters _____ This Schedule for Fan _____

Calculations By _____ Checked by _____ 191__ O. K. _____ 191__

Plenum or Exhaust System _____ Heating or Ventilation _____

Foul Air discharged, How _____

Fan	Engine Size	Tempering Coils	Heating Coils
Type	Steam Pres.	Type	Type
Size	Type	Base	Base
Speed	Steam	Sq. Ft. Rad.	Sq. Ft. Rad.
Capacity C. F. M.	Exhaust	Lin. Ft. Rad.	Lin. Ft. Rad.
Pressure-dynamic OZ		No. Rows	No. Rows
H. P. Required		No. Sections	No. Sections
Housing	Motor H. P.	No. Groups	No. Groups
Height Housing	Speed	Height	Av. Height
Width "	Type	Long pipe–	Length
Dia. Wheel	Current	Short pipe–	Free Area
Inlet Dia.	Voltage	Length	
No. of Inlets	Drive	Free Area	Blow thru or
Outlet Size	Control		Draw thru
Remarks	Remarks	Remarks	Remarks

Air Washer _____ Capacity C. F. M. _____ At Velocity _____ F. P. M.

Remarks _____

DUCT SYSTEM

Material _____ Remarks _____

At Point	C. F. M.	V. F. M.	Size Duct	Friction Loss OZ	Remarks	At Point	C. F. M.	V. F. M.	Size Duct	Friction Loss OZ	Remarks

(OVER)

Floor _____

ROOM				AIR				FRESH AIR REG.					FOUL AIR REG.				
Name or Use	Our No.	No. People	H. L. B.T.U.	C. F. Person	Air Change	Total C.F.M.	Max. Temp.	No.	Vel. Air	Size	Type	Location	No.	Vel. Air	Size	Type	Location

FIG. 2.—FRONT AND BACK OF FAN SYSTEM SCHEDULE SHEET.

Daily Time and Expense Report

CHARLES L. PILLSBURY CO., ENGINEERS

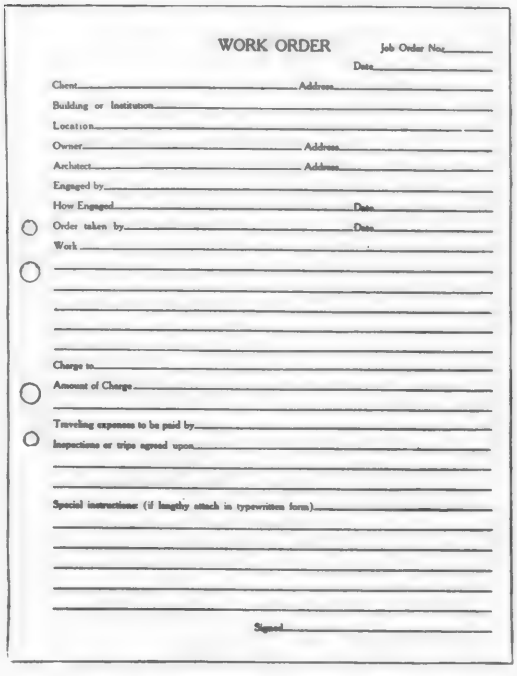
Report of _____ Date _____ 191__

Job. No.	Job	Work done and expense incurred	Time		Hours								Expense	
			From	To	Calculations	Draughting	Specifications	Checking	Inspecting	Interviews	Correspondence	Miscellaneous		
Total Hours		TOTALS												

O. K. _____

Reports to be made out in ink carefully and explicitly and submitted daily

FIG. 3.—DAILY TIME AND EXPENSE REPORT BLANK.



WORK ORDER Job Order No. _____

Date _____

Client _____ Address _____

Building or Institution _____

Location _____

Owner _____ Address _____

Architect _____ Address _____

Engaged by _____

How Engaged _____ Date _____

Order taken by _____ Date _____

Work _____

Charge to _____

Amount of Charge _____

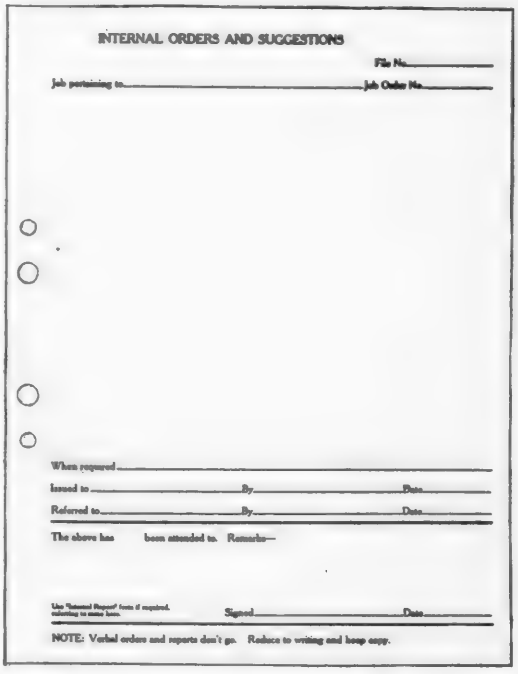
Traveling expenses to be paid by _____

Inspections or trips agreed upon _____

Special instructions (if lengthy attach in typewritten form) _____

Signed _____

FIG. 4.—WORK ORDER SHEET.



INTERNAL ORDERS AND SUGGESTIONS

File No. _____

Job pertaining to _____ Job Order No. _____

When required _____

Issued to _____ By _____ Date _____

Referred to _____ By _____ Date _____

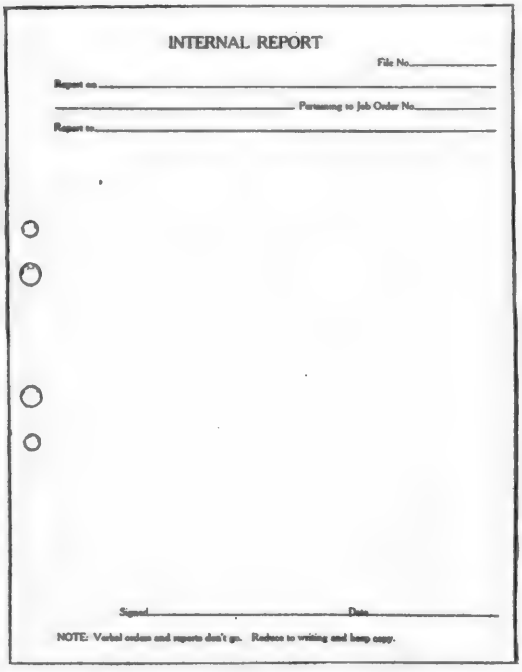
The above has been attended to. Remarks—

Use "Internal Report" form if required, referring to same here.

Signed _____ Date _____

NOTE: Verbal orders and reports don't go. Reduce to writing and keep copy.

FIG. 5.—INTERNAL ORDER AND SUGGESTION SHEET.



INTERNAL REPORT

File No.

Report on

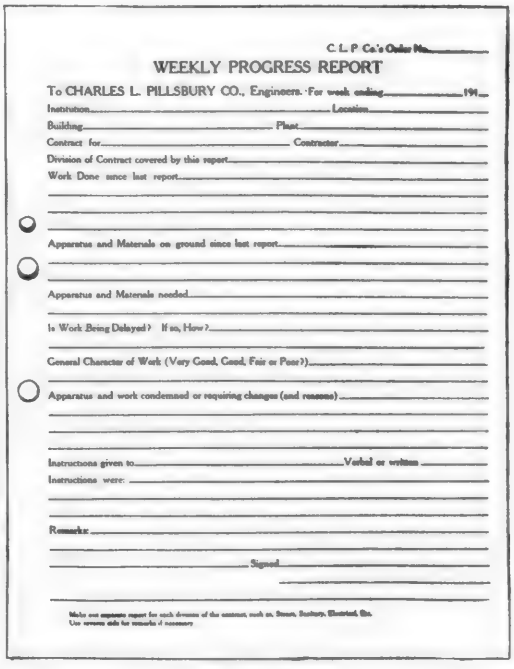
Pertaining to Job Order No.

Report to

Signed Date

NOTE: Verbal orders and reports don't go. Reduce to writing and keep copy.

FIG. 6.—INTERNAL REPORT BLANK.



C. L. P. Co.'s Order No.

WEEKLY PROGRESS REPORT

To CHARLES L. PILLSBURY CO., Engineers. For week ending 191

Institution Location

Building Plant

Contract for Contractor

Division of Contract covered by this report

Work Done since last report

Apparatus and Materials on ground since last report

Apparatus and Materials needed

Is Work Being Delayed? If so, How?

General Character of Work (Very Good, Good, Fair or Poor?)

Apparatus and work condemned or requiring changes (and reasons)

Instructions given to Verbal or written

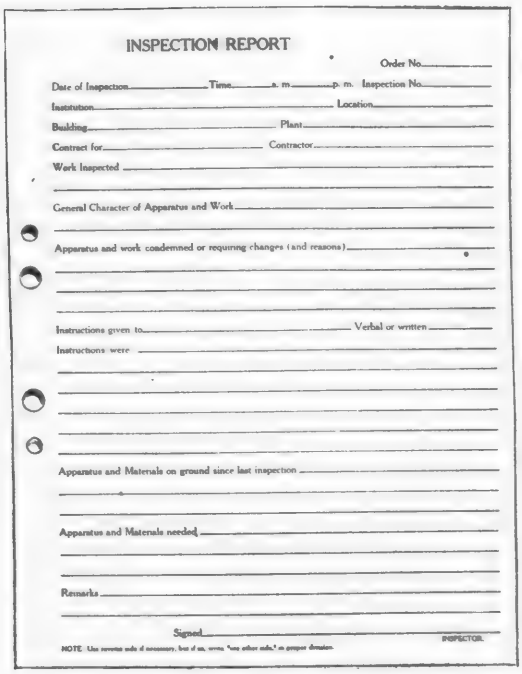
Instructions were:

Remarks:

Signed

Make out separate report for each division of the contract, such as Steam, Sanitary, Electrical, Etc. Use reverse side for remarks if necessary

FIG. 7.—BLANK FOR WEEKLY PROGRESS REPORT.



INSPECTION REPORT

Order No.

Date of Inspection Time a. m. p. m. Inspection No.

Institution Location

Building Plant

Contract for Contractor

Work Inspected

General Character of Apparatus and Work

Apparatus and work condemned or requiring changes (and reasons)

Instructions given to Verbal or written

Instructions were

Apparatus and Materials on ground since last inspection

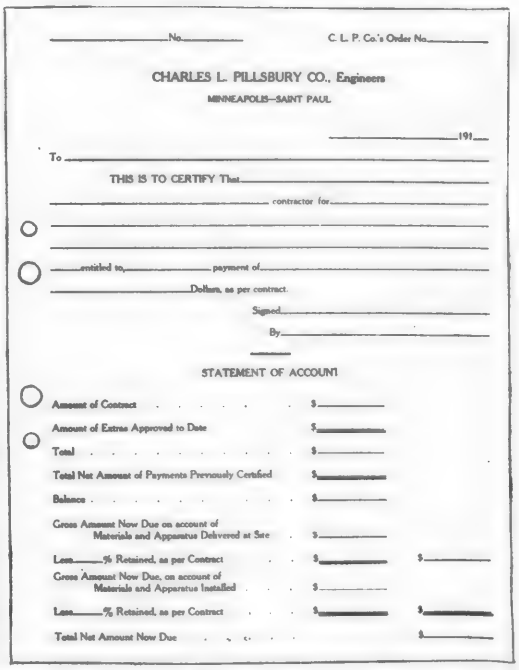
Apparatus and Materials needed

Remarks

Signed INSPECTOR.

NOTE. Use reverse side if necessary, but if so, write "see other side" on proper division.

FIG. 8.—INSPECTION REPORT BLANK.



No. C. L. P. Co.'s Order No.

CHARLES L. PILLSBURY CO., Engineers

MINNEAPOLIS—SAINT PAUL

191

To

THIS IS TO CERTIFY That contractor for

entitled to payment of

Dollars, as per contract.

Signed

By

STATEMENT OF ACCOUNT

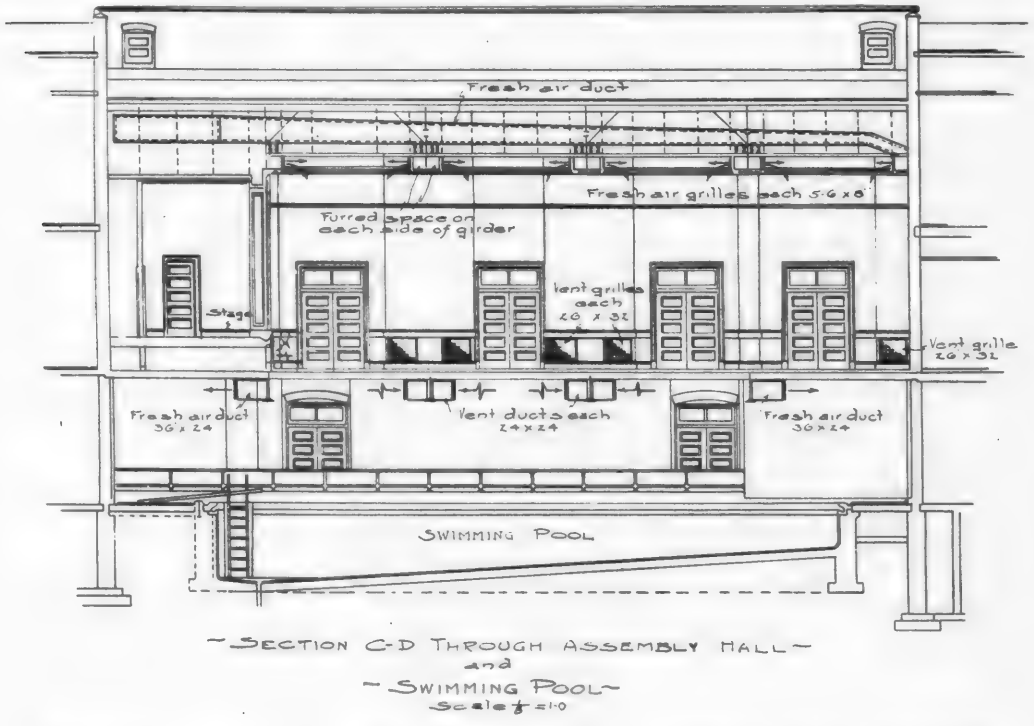
Amount of Contract	$	
Amount of Extras Approved to Date	$	
Total	$	
Total Net Amount of Payments Previously Certified	$	
Balance	$	
Gross Amount Now Due on account of Materials and Apparatus Delivered at Site	$	
Less % Retained, as per Contract	$	$
Gross Amount Now Due, on account of Materials and Apparatus Installed	$	
Less % Retained, as per Contract	$	$
Total Net Amount Now Due		$

FIG. 9.—FORM FOR CERTIFYING AMOUNT OF WORK DONE WITH STATEMENT OF ACCOUNT.

A School Equipment Based on the New Ventilation Ideas

THE WETHERSFIELD AVENUE SCHOOL, HARTFORD, CONN.

A direct result of the recirculation and other ventilation experiments conducted at the International Y. M. C. A. College at Springfield, Mass., is to be seen in the mechanical equipment of the new Wethersfield Avenue School, Hartford, Conn., which is shown in the accompanying illustrations. It will be noted at once that the ventilation system as planned, is more complete and different from the regular order of school houses.

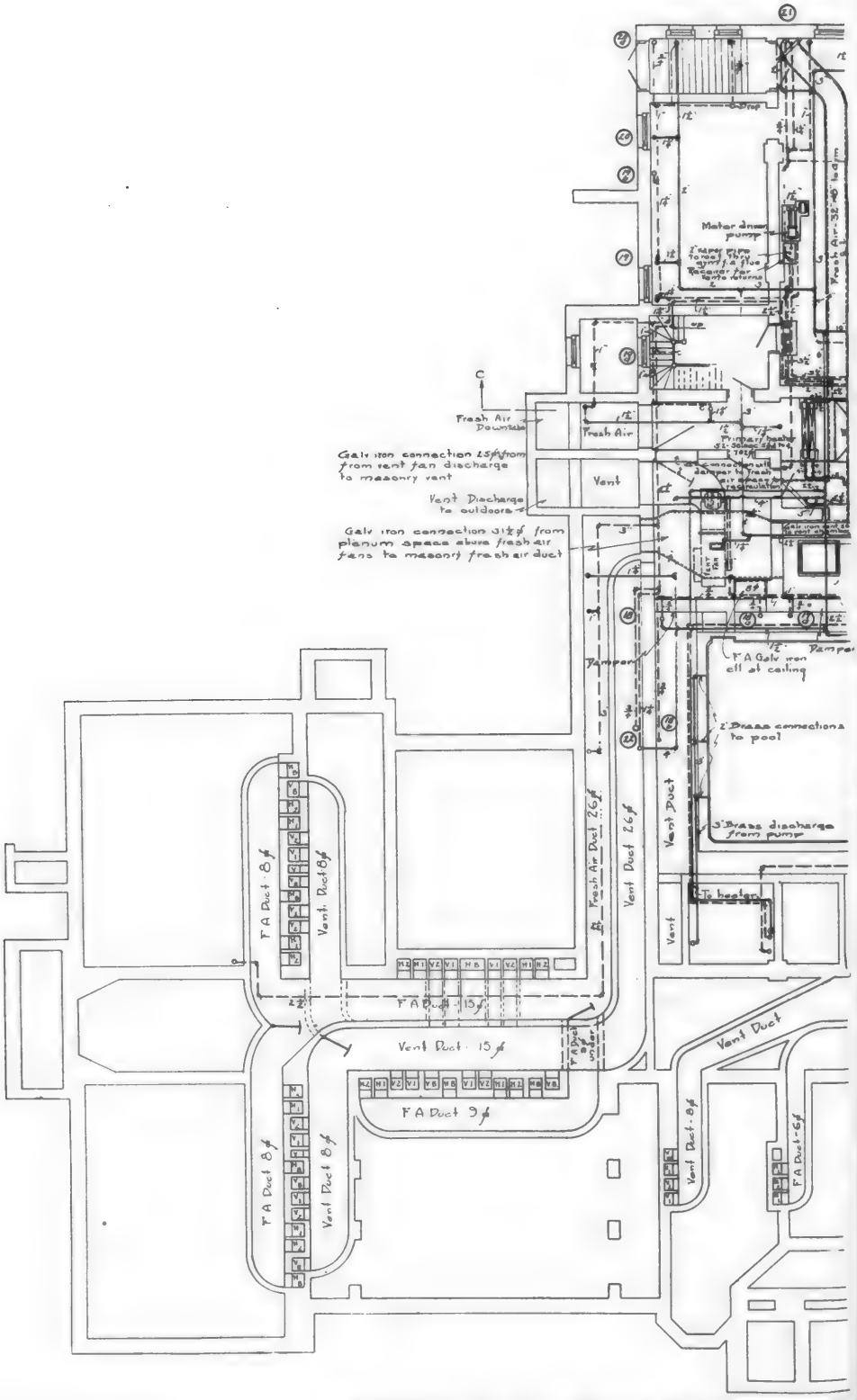

Fresh air duct
Fresh air grilles each 5-6 x 8
Furred space on each side of girder
Stage
Vent grilles each 20 x 32
Vent grille 20 x 32
Fresh air duct 36 x 24
Vent ducts each 24 x 24
Fresh air duct 36 x 24
SWIMMING POOL
~SECTION C-D THROUGH ASSEMBLY HALL~
and
~SWIMMING POOL~
Scale 1/4 = 1-0

SECTION C-D THROUGH ASSEMBLY HALL AND SWIMMING POOL, WETHERSFIELD SCHOOL.

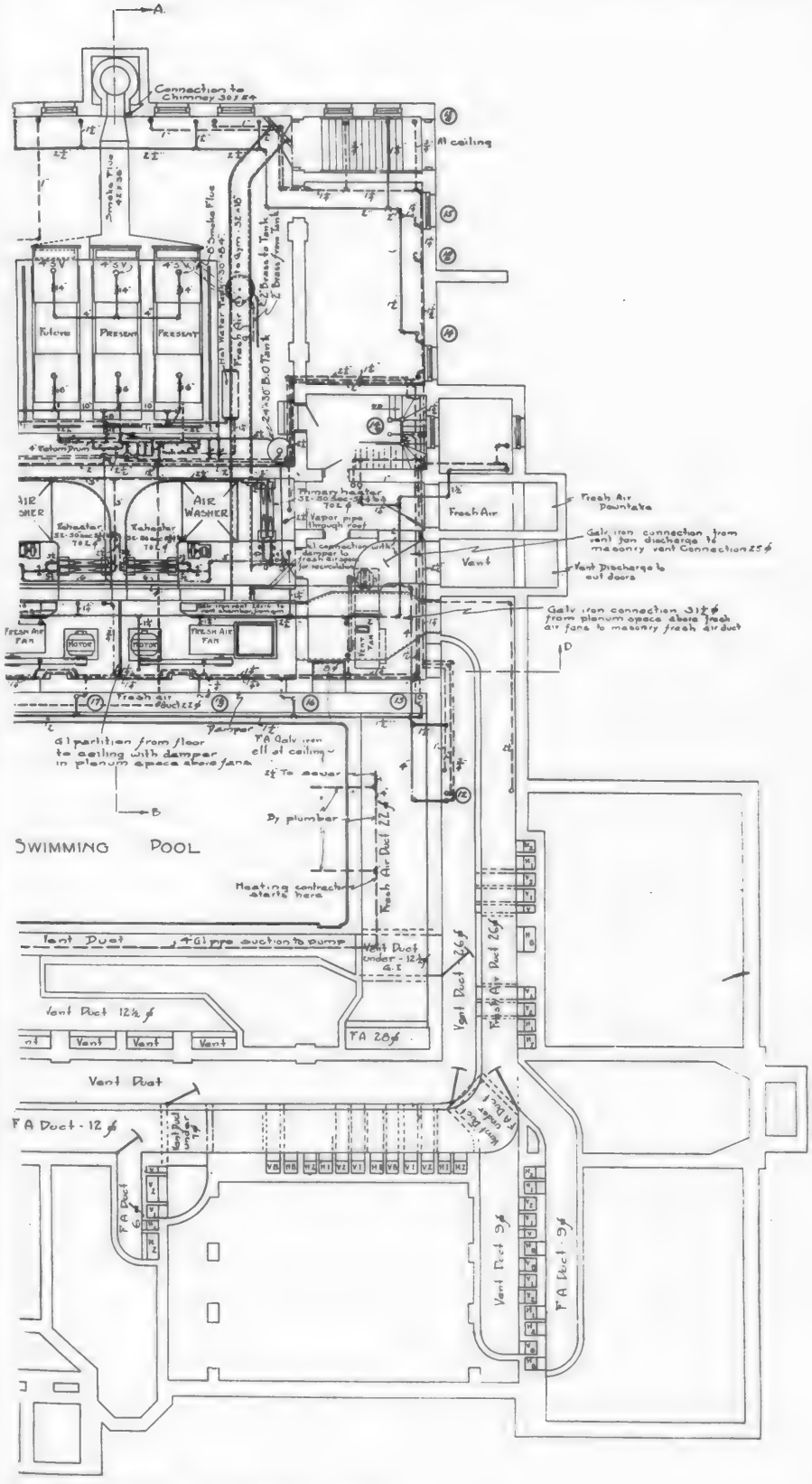
Among other things it provides ventilation to the amount of 50 cu. ft. of air per minute in and out for every occupant of the school rooms, auditorium, gymnasium and swimming pool room.

The fans are also arranged either to draw all fresh air from out of doors and discharge all vents outdoors or to recirculate the air from the rooms through air washers back to the class rooms, mixing this air with whatever amount of fresh air may be required. In this connection, the designers of the plant express their belief that "experiments and tests have proven beyond dispute that, with proper air washers installed, the vent air drawn from the rooms can be washed and, after mixing with approximately 10 per cent. of fresh air, returned to the class rooms with even better results than all outdoor air, thus saving the heat in this air which would otherwise have to be thrown out-of-doors and other air heated to take its place."

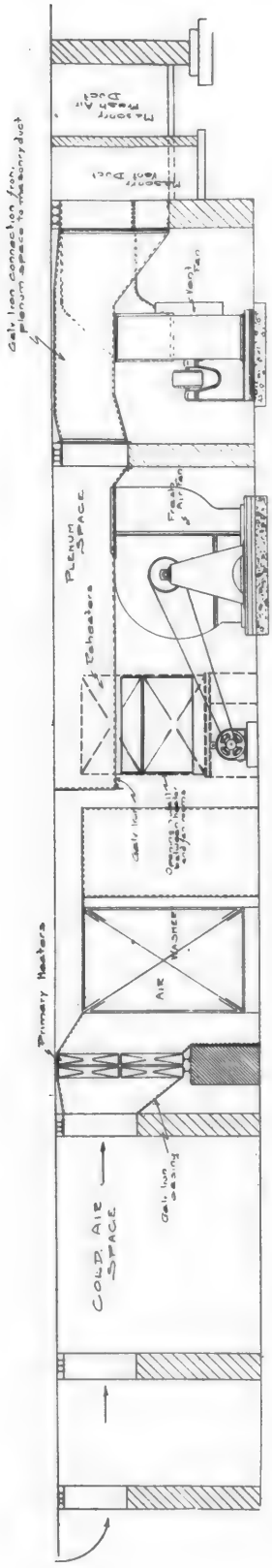
In considering this building, the engineers were asked to figure the ventilation on the basis of at least 50 cu. ft. of air per occupant in each room using the recirculating system and with the necessary air washers and apparatus for giving proper humidity to the air as it enters the rooms. For this purpose a system of low pressure steam heating


Fresh Air Downstairs
Fresh Air
Primary heater
Vent
Vent Discharge to outdoors
Galv iron connection 25 sf from from vent fan discharge to masonry vent
Galv iron connection 31 sf from planum space above fresh air fans to masonry fresh air duct
Pumproom
FA Galv iron ell at ceiling
2" Brass connections to pool
3" Brass discharge from pump
To heater
Fresh Air Duct 26 sf
Vent Duct 26 sf
Vent Duct
FA Duct 8 sf
Vent Duct 8 sf
FA Duct 15 sf
Vent Duct 15 sf
FA Duct 9 sf
FA Duct 8 sf
Vent Duct 8 sf
Vent Duct 8 sf
FA Duct 6 sf

FOUNDATION AND CELLAR PLAN, WETHERS
SHOWING GENERAL ARRANGEMENT



FIELD SCHOOL. HARTFORD, CONN.
OF HEATING SYSTEM.



SECTION C B D THROUGH FAN AND HEATER ROOMS, WETHERSFIELD SCHOOL.

was adopted, using direct radiation in the form of pipe coils for the heating of the class rooms, where possible, and cast-iron direct radiation elsewhere. The piping system is the underneath feed supply and return system, with air valves piped to basement and thence to drain outlet to prevent odors in closs rooms and offices. The piping is exposed with run-outs to radiators and coils above the floor.

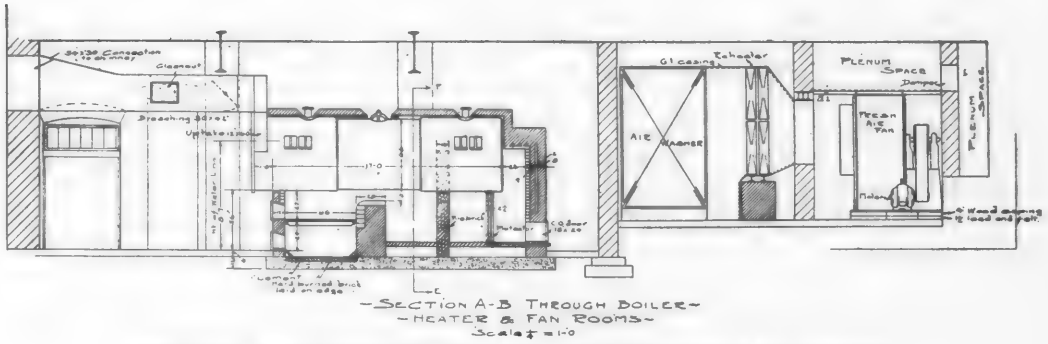
A system of automatic control is installed to maintain the temperature of the rooms constantly at the desired point by automatically turning off or on the direct radiation, as the weather requires. The Johnson system was used.

The boiler plant consists of two 66-in. diameter by 18 ft. 6 in. long, horizontal return, fire-tube boilers, good for 125 lbs. pressure, but intended to be operated at from 2 to 5 lbs. for this system. The boilers have a total grate surface of 59 sq. ft. and are brick-set, with special settings to help reduce the smoke and increase the efficiency of the plant.

The entire radiation system, except the fan coils, is drained to the boilers by gravity. As the fan coils of necessity come below the water level of the boilers, these returns are forced back to the boilers by a pump, motor-driven, operated by a main chain float switch so as to run only when necessary.

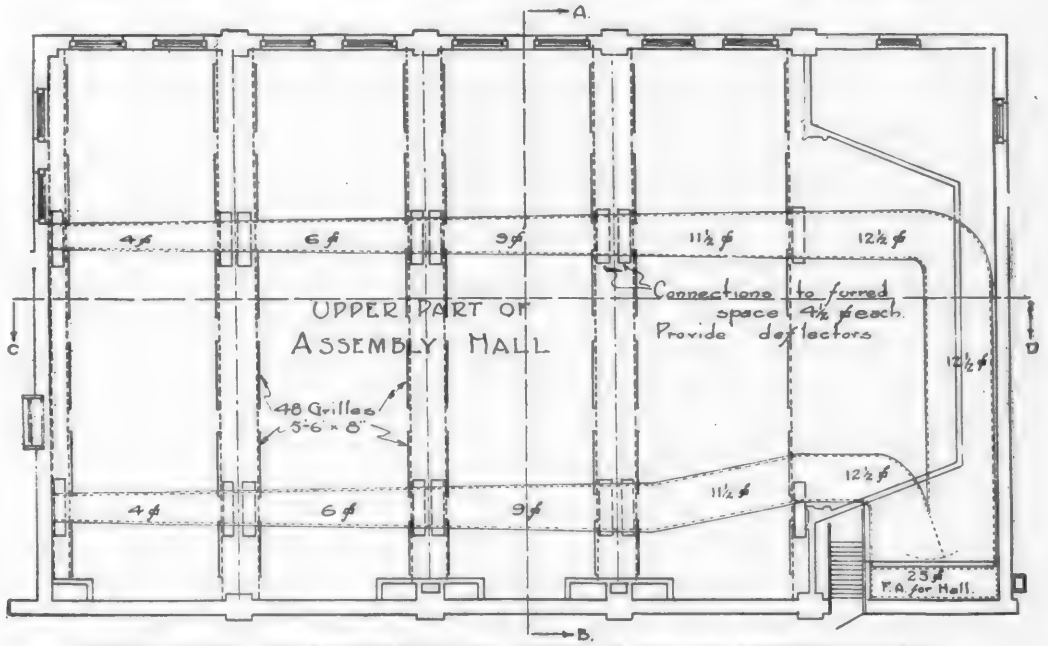
In connection with the ventilation system, it was thought necessary to keep the cost of the apparatus down to a reasonable limit to plan for all branches of the building to be in full use at once. For this reason the same fans which operate for the class rooms are made to handle the auditorium or gymnasium as desired, or to give a reduced amount of air to all at once, this result being accomplished by means of dampers. As already stated, all the air coming to the fresh air fans is drawn through air washers and cleaned and humidified before being sent to the classroom.

As the class rooms, fully occupied, throughout the rest of the building, with an allowance for future rooms, require a grand total of 74,000 cu. ft. of fresh air per minute on a basis of 50 cu. ft. per occupant, two fresh air fans are installed, driven by two 10 H. P. motors, and two vent fans, with slightly less ca-



SECTION A-B THROUGH BOILER, HEATER AND FAN ROOMS, WETHERSFIELD SCHOOL.

SECTION A-B, THROUGH ASSEMBLY HALL, WETHERSFIELD SCHOOL.



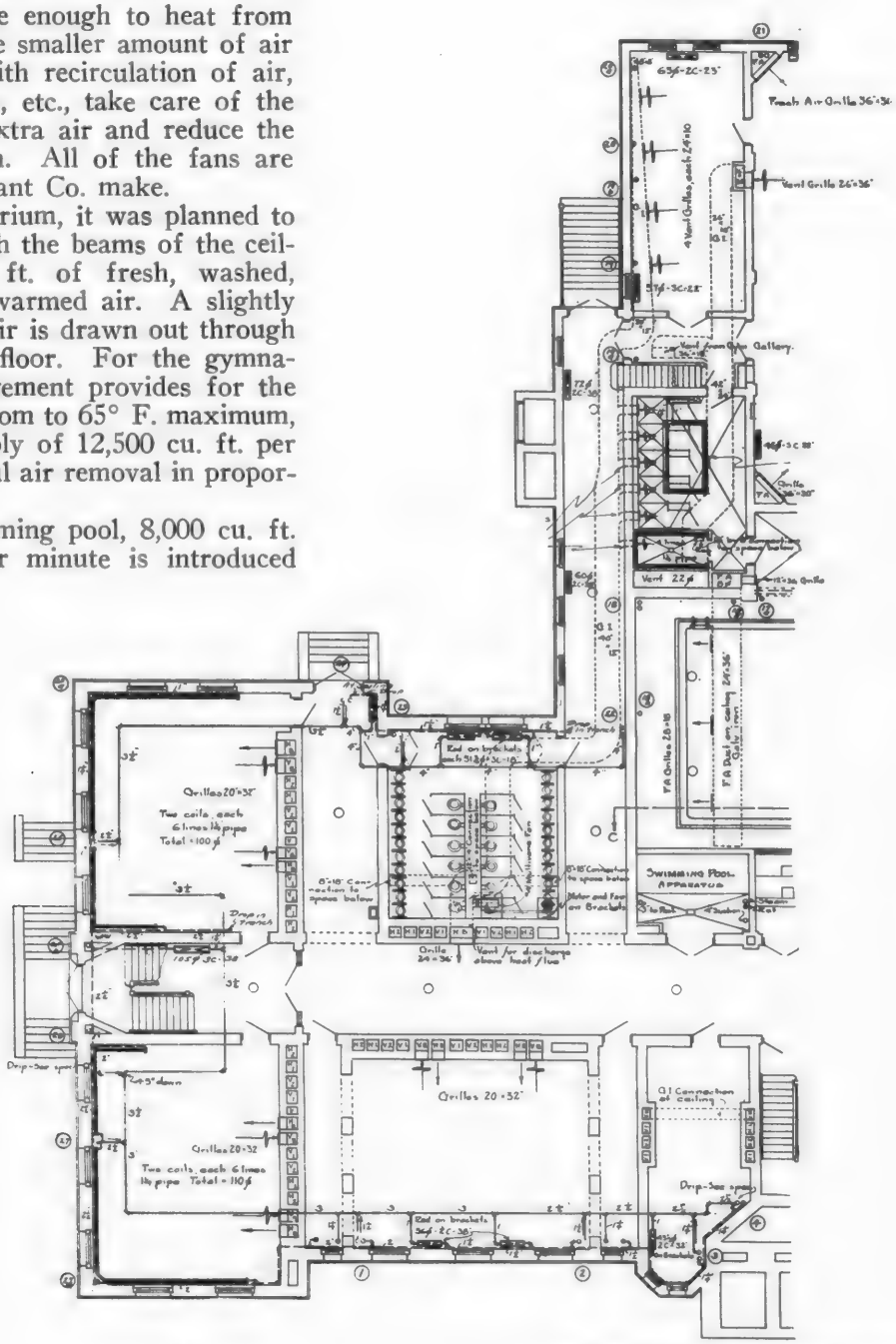
VENTILATING ARRANGEMENTS IN UPPER PART OF ASSEMBLY HALL, WETHERSFIELD SCHOOL.

pacity, are installed to draw out the foul air and send it out-of-doors or back through the air washers to the fresh air fans, as required. If the Massachusetts standard of ventilation had been adopted, a total of 44,000 cu. ft. of air would have had to be handled by the fans. As the larger quantity of air mentioned is only to be used when the air is recirculated, it was planned to make the air heaters and boilers only large enough to heat from 0° to 70° F. the smaller amount of air mentioned, as with recirculation of air, the pupils, lights, etc., take care of the heating of the extra air and reduce the coal consumption. All of the fans are of B. F. Sturtevant Co. make.

For the auditorium, it was planned to introduce through the beams of the ceiling 22,000 cu. ft. of fresh, washed, humidified and warmed air. A slightly less amount of air is drawn out through grilles near the floor. For the gymnasium, the arrangement provides for the heating of the room to 65° F. maximum, with an air supply of 12,500 cu. ft. per minute and a foul air removal in proportion.

For the swimming pool, 8,000 cu. ft. of fresh air per minute is introduced through ducts beside girders and a proportionate amount of foul air taken out through other ducts beside the center girders.

The shower, toilet and locker rooms are ventilated through the ducts, carried to small fans, one located on each side


Fresh Air Grille 36"×36"
Vent Grille 26"×36"
4 Vent Grilles, each 24"×10"
Vent from Gym Gallery
Vent 22"ø
Grilles 20"×32"
Two coils, each 6 lines 1½ pipe Total = 100 ft
Two coils, each 6 lines 1½ pipe Total = 110 ft
Swimming Pool Apparatus
Grilles 20"×32"
Vent for discharge above heat flue
Drop-Sec spec
Grilles 20"×32"

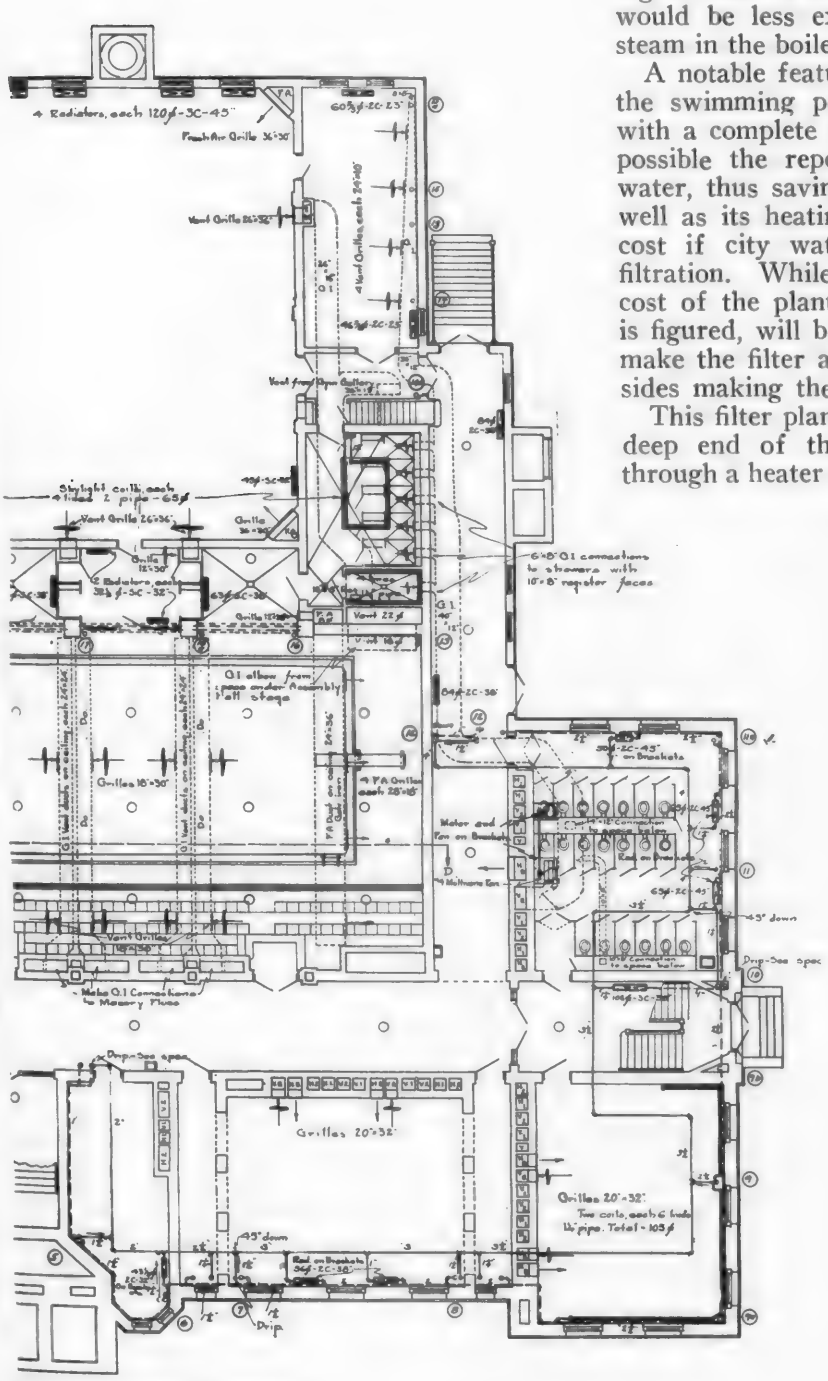
FLOOR PLAN OF BASEMENT,

of the building, discharging this foul air out through the roof of the building with a by-pass connection around the fans, so that the rooms will vent by gravity to a limited extent and thus keep free from odors when the school is not in use.

All of the fans are motor-driven, as it was thought better to do this than to change the boilers over to a higher pressure system to operate engines to drive this apparatus. The cost of operation with engines, it was estimated by the engineers, would be somewhate less, but the motors required less initial cost, less the care for operation, while, if the building is used in summer, the motor-drive would be less expensive than carrying steam in the boilers at that time.

A notable feature of the equipment is the swimming pool, which is provided with a complete filtration plant to make possible the repeated use of the same water, thus saving the cost of water as well as its heating, over what it would cost if city water were used without filtration. While this added to the first cost of the plant, the operating cost, it is figured, will be reduced sufficiently to make the filter a paying investment, besides making the pool healthy and safe.

This filter plant draws water from the deep end of the pool, then passes it through a heater to bring the temperature


4 Radiators, each 120 sf - 3C - 45"
Fresh Air Grille 36"x30"
Vent Grille 26"x32"
4 Vent Grilles each 24"x40"
Vent from Upper Gallery
Skylight curb, each 4 tiers 2" pipe - 65 sf
Vent Grille 26"x36"
Grille 36"x30"
Grille 12"x30"
6 Radiators, each 38 sf - 5C - 32"
Grille 15"x30"
Vent 22 sf
6"x8" O.I. connections to showers with 10"x8" reducer faces
O.I. elbow from pipe under Assembly Hall stage
Grilles 15"x30"
4 F.A. Grilles each 28"x48"
Motor and Fan on Bracket
Vent Grilles
Make O.I. Connections to Masonry Flues
Drip-See spec
Grilles 20"x32"
45° down
Red on Bracket
Drip
Grilles 20"x32"
Two coils, each 6 tube 1½" pipe. Total - 108 sf

WETHERSFIELD SCHOOL.

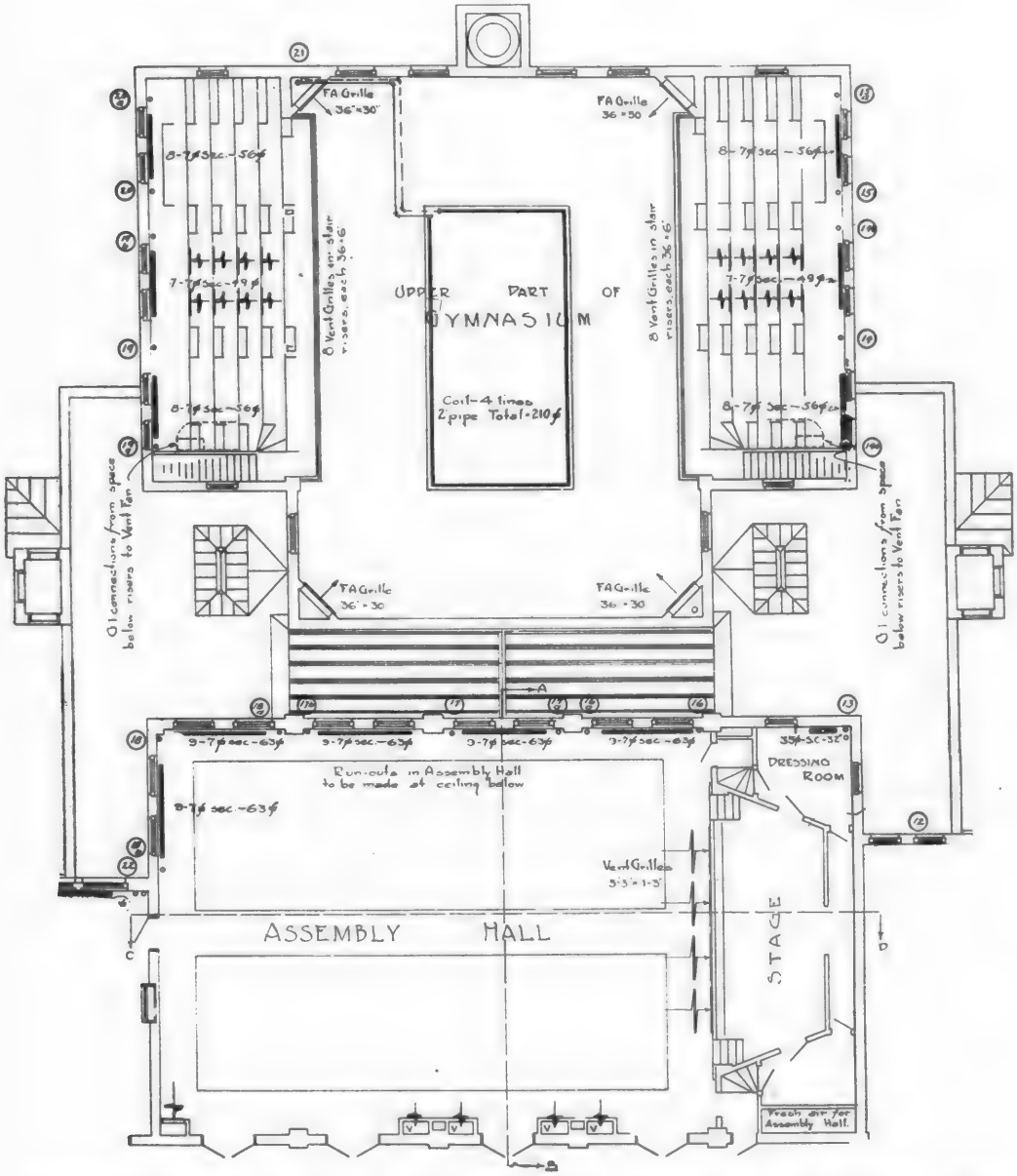
A notable feature of the equipment is the swimming pool, which is provided with a complete filtration plant to make possible the repeated use of the same water, thus saving the cost of water as well as its heating, over what it would cost if city water were used without filtration. While this added to the first cost of the plant, the operating cost, it is figured, will be reduced sufficiently to make the filter a paying investment, besides making the pool healthy and safe.

This filter plant draws water from the deep end of the pool, then passes it through a heater to bring the temperature

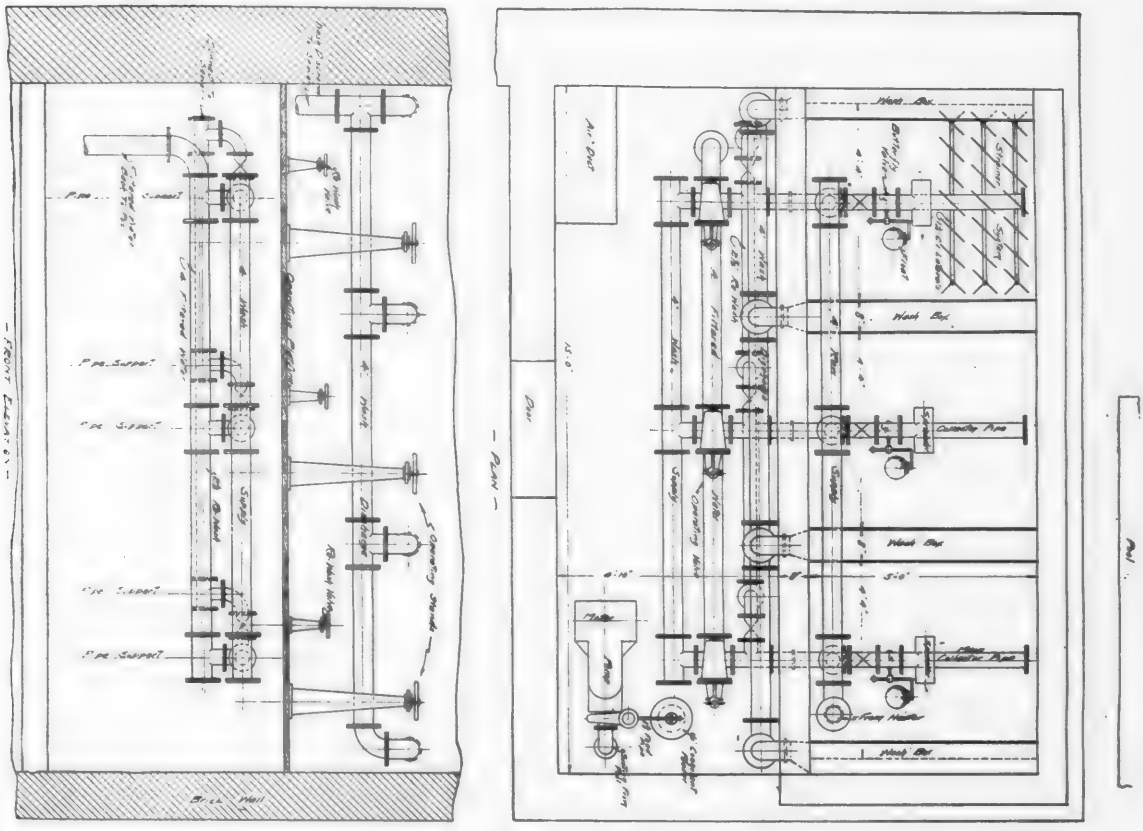
the filtration medium (sand, etc.), back into the pool at the shallow end, thus making a circuit from the deep end of the pool to and through the filters back to the shallow end of the pool. In addition to the filters, there is an alum mixing device and a device for introducing other chemicals needed to purify the water.

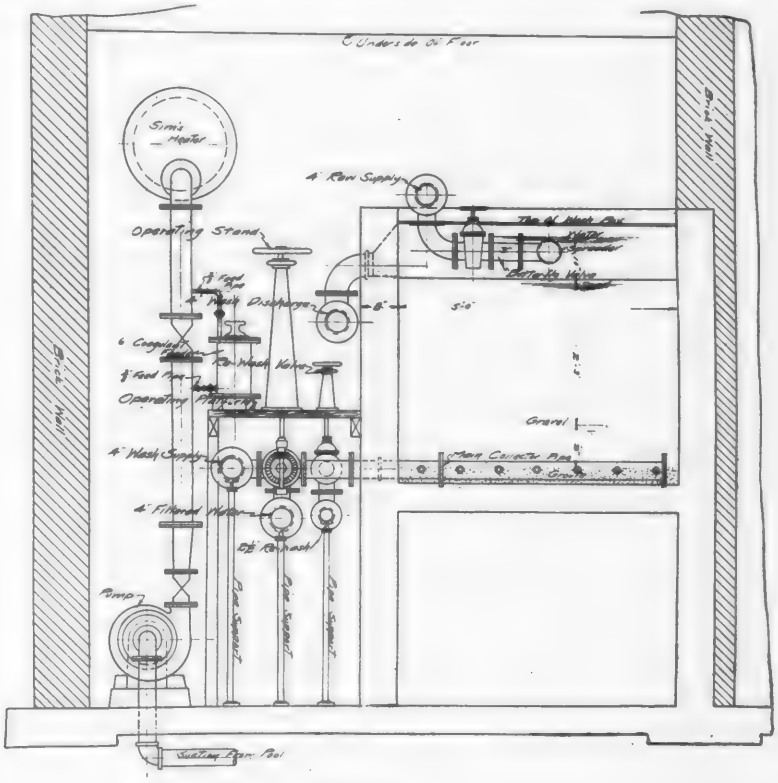
The number of hours the filter is in operation depend on the use, but the installation provides a capacity of from 125 to 130 gals. per minute, this plant being designed to do all the filtration required in 8 hrs. or less, depending on the water used and the number of hours the pool is in use.

The engineers express the opinion that with a pool installed in a public school, a proper filter plant is a necessity for, without this filter plant, the water in the


FA Grille 36"×30"
FA Grille 36"×30"
8 Vent Grilles on stair risers, each 36"×6"
8 Vent Grilles on stair risers, each 36"×6"
UPPER PART OF GYMNASIUM
Coil-4 lines 2 pipe Total-210 sq ft
8-7½ sec-56 sq ft
7-7½ sec-49 sq ft
8-7½ sec-56 sq ft
8-7½ sec-56 sq ft
7-7½ sec-49 sq ft
8-7½ sec-56 sq ft
01 connections from space below risers to Vent Fan
01 connections from space below risers to Vent Fan
FA Grille 36"×30"
FA Grille 36"×30"
9-7½ sec-63 sq ft
9-7½ sec-63 sq ft
9-7½ sec-63 sq ft
9-7½ sec-63 sq ft
35½ SC-35
DRESSING ROOM
Run-outs in Assembly Hall to be made at ceiling below
8-7½ sec-63 sq ft
Vent Grilles 5'3"×1'3"
ASSEMBLY HALL
STAGE
Fresh air for Assembly Hall

ARRANGEMENT OF HEATING AND VENTILATING APPARATUS IN ASSEMBLY HALL AND UPPER PART OF GYMNASIUM, WETHERSFIELD SCHOOL.





FILTRATION PLANT FOR SWIMMING POOL, WETHERSFIELD SCHOOL.

to the proper point, then to and through pool becomes more or less dangerous to health after the second or third day it is used and would need changing. With the filter, the pool need not be emptied more than once or twice a season.

While the heating and ventilating system as designed is intended to be as complete and thoroughly modern as is be found in the East, and the most thoroughly efficient system yet designed for a grammar school building, the engineers state that the factor of economy has also been given careful consideration, both in first cost and in operation, and that the installation as made will give a maximum of ventilation at a mimium cost.

The architects of the building are Whiton and McMahon, Hartford, Conn. The entire mechanical plant was designed by the Richard D. Kimball Co., Boston, Mass. The contractors for the heating and ventilating system are Libby & Blinn, Hartford.

Recirculation of Air for Schools

COMPARISON OF SIX POSSIBLE METHODS OF ACCOMPLISHING THE DESIRED RESULTS.

BY IRA N. EVANS, C. E.

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Recirculation of the air in school buildings has received considerable attention as a method of reducing the operating expenses of the ventilating system, especially during extreme winter weather. Like most engineering questions, there is opportunity for a division of opinion among engineers, due mainly to the fact that some have not taken all the conditions of the problem into consideration; yet opponents and advocates both have some truths to justify their standpoints.

Ventilation with proper air conditioning is an expensive luxury or necessity (as the case may be) from an operating standpoint. Convincing arguments are required on the part of the engineer to persuade school boards as to its necessity during the initial conception of any plant, and still further argument is needed to show its advantages after the discovery of how much is added to the fuel and water bill by its operation.

Due to this extra expense it has been suggested that the air be recirculated through an air washer in order to conserve the fuel charge. These claims of economy too often neglect other items of expense entering into the problem.

An effort will be made to give an unbiased discussion of the expense of handling school buildings by various methods. The results give a clear conception as to the relative operating costs, although perhaps not exactly what would be found in practice for any one of the given methods under discussion.

In engineering problems the best method will be the one accomplishing the results for the minimum charge, made up of interest and depreciation on apparatus and necessary building construction added to the operating expense. Costs and interest charges, those old-time expedients of the engineer to juggle figures and kill some other fellow's scheme, are omitted in this discussion. They may, however, be added by the reader in such manner as he sees fit, and both opponents and advocates will be satisfied that their various opinions were not wholly incorrect.

The minimum charge in some cases may lead to a seemingly high operating cost which is compensated for by reduced expense in building construction and apparatus. Any method of recirculation will necessarily increase the expense of building construction in the provision for return air ducts over the use of corresponding apparatus in the roof space, while the hotter exhausted air may be passed to the outside for a somewhat less expenditure of power in the latter case. The relative differences in operating costs of the several methods herein discussed give a fair idea of how much may be applied to increased first cost in order to have a minimum operating expense.

SIX POSSIBLE METHODS.

There are six possible methods discussed and the results are tabulated in Table IV.

1—Use of all outside air heated to 70° F., with no provision for humidity (Table I.)

2—Use of all outside air heated to 67° F. (50% relative humidity). Humidity provided by an air washer. (Table II.)

3—Use of all outside air heated to 67° F. (50% relative humidity). Humidity provided by steam vapor. (Table II.)

4—Recirculation of all air below 60° —10° F. outside and 70° F. in the room for maximum conditions with a leakage of ⅝ of the cubic contents per hour or 43,500 B. T. U. per hour.

The quantities and methods of computation are all given in the tables; only the results and salient features will be discussed in the text.

The hours for each period were compiled from the weather bureau reports with an operating day of 6 hours. There are 400 hours of 60°-70° F. when little

TABLE I

1-NO HUMIDITY OUT-DOOR AIR SUPPLY

Cubic Contents Room 8640 Cu. Ft. TEMPERATURE ROOM 70°-OUTSIDE TEMPERATURE -10° Heat Dissipated by Pupils 270 BTU
Pupils 40 MAXIMUM B.T.U. LOSS OF ROOM 43500 PER HOUR per hour-40 Pupils=11000 B.T.U.
Air Supply 1600 Cu. Ft. per Minute H.P. per 1000 Cu. Ft. Air per Min. .26 H.P.

Outside Temperature Degrees F.	Hours Each Period	Proportion Heat Loss each Period	Percentage Heat Loss	Heat Loss B.T.U. per Hour for Each Period	Temperature Rise for Air Supply Deg. F.	Grains Moisture per Cu. Ft. Entering Air	Relative Humidity Entering Air	Relative Humidity Gr. to Deg. F.	B.T.U. per Hour for Moisture.	B.T.U. per Hour Heat Pupils Emitted	B.T.U. per Hour For Dry Air Supply	Total B.T.U. per Hour Required.	Total B.T.U. per Period and Season.	B.T.U. per Hour for Power not required for Heating	B.T.U. per Season in Excess of Heating for Power.
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
				43500 B.T.U. × Col. D					6.2 × Col. G × Col. F	Col. E − 11000 B.T.U.	Col. F × 1824	Col. J + Col. K + Col. L	Col. M × Col. B	43200 B.T.U. − Col. M	Col. B × Col. O
0°-10°	5	65/80	82	35340	65	.25	60	5	100	24340	118560	143000	715000	——	——
10°-20°	27	55/80	69	30000	55	.50	60	8	170	19000	100320	119490	3225930	——	——
20°-30°	110	45/80	57	24470	45	1.00	60	12	280	13470	82080	95830	10541300	——	——
30°-40°	270	35/80	44	19000	35	1.23	30	15	271	8000	63840	72111	19468970	——	——
40°-50°	180	25/80	31	13600	25	1.75	50	25	271	2600	45600	48471	9208480	——	——
50°-60°	232	15/80	20	8156	15	2.50	50	30	232	− 2944	27360	24648	5718336	18552	4305224
60°-70°	400	5/80	7	2720	5	3.00	45	38	93	− 8280	9120	933	373200	42267	16806800
TOTALS	1234												49,253,216		21,212,024

Power For Fans Supply and Exhaust Same.
1600 Cu. Ft. × .6 = .8 Horse Power. / 1000
Available Heat from Exhaust Steam
Rate 6 Lbs. per Horse Power; 900 B.T.U. per lb.
8 × 6 Lbs. × 900 B.T.U. = 43200 B.T.U. per Hour
9 Lbs. Water per lb. Coal from and at 212° F.
970 B.T.U. = Latent Heat per lb.; 2000 lbs. = 1 Ton. Coal
48 × 7/8 × 1200 Hours = 7404 K.W.H. per Season
Heat per 1000 Cu. Ft. per Min. per Degree per Hour for Dry Air
.08 Lbs. × .237 × 60 Min. × 1600 Cu. Ft. = 1824 B.T.U.

Pounds Water per Grain Moisture per Hour for 1600 Cu. Ft. Air per Minute 1600 × 60 / 7000 = 13.7 lbs.
B.T.U. per Hour per Degree Raise in Temperature of Vapor 13.7 lbs. × 45 = 620 B.T.U. per Grain.
Coal $4.00 per Ton
Power .05 per Kilowatt

Electric Power 7404 K.W.H. × .05 = $37.02
Coal for Heating
49,253,216 B.T.U. / 2000 × 9 × 970 B.T.U. = 282 Tons @ $4.00 = $1128
Excess Coal for Power
21,212,024 B.T.U. / 2000 × 9 × 970 B.T.U. = 1215 Tons @ $4.00 = $4.86

to 70° F. period, using city water for cooling. (Table III.)

5—Partial recirculation with a portion of outside air for cooling with air washer. (Table III.)

6—Partial recirculation with a portion of outside air for cooling, using steam vapor for humidity. (Table III.)

CLASSROOM CHOSEN AS UNIT.

The unit in each case will be one classroom of 8,640 cu. ft. with 40 pupils and 1,600 cu. ft. of air per minute supplied and exhausted from the room mechanically. The heat losses are figured for or no heating is required, although many of these hours occur during the colder months.

It is understood that the building is heated during non-sessions by direct radiation with heat control, but these periods will not be considered in the discussion as ventilation is unnecessary.

It is generally admitted that direct radiation will give better satisfaction and economy for supplying the radiation losses of the building than the use of the air system, although when recirculating ducts are provided, the building may be

heated during non-sessions by the fresh air system.

The use of higher temperatures of air to provide for the heat losses of the room to the outside instead of the direct radiation would not affect this discussion or results.

The proportion of the heat dissipated from the room to the outside is determined in Cols. C, D, E, Table I. This is not the true fuel expense of the system at higher outside temperatures, as a heating system will seldom fall below 25% of its maximum capacity regardless of the outside temperature, due to radiation of mains and other unavoidable losses incident to operation under conditions of minimum requirements.

The relative humidity and grains of moisture in the entering air are all given in the proper columns and were arbitrarily assumed the same for all methods as the average condition in this climate. Cols, G, H, I, Table I. Note the low relative humidity at 70° F. in Col. I, as this is the main source of objection and discomfort where facilities for air conditioning are not provided.

The constant 1824, is used throughout and is the weight per cubic feet, specific heat, and cubic feet of air per hour to furnish 1,600 cu. ft. per minute. There is an element of error in using the same weight per cubic foot throughout, especially in determining the amount of moisture in grains per cubic foot, but as different weights and specific volumes would unnecessarily complicate matters, and the same assumption was made throughout, the relative results are not appreciably affected.

The constant 13.7 is the number of pounds per grain per hour in 1,600 cu. ft. of air per minute.

Constant 6.2 is the 13.7 multiplied by 0.45, the specific heat of water vapor.

The heat dissipated by the 40 pupils at 275 B. T. U. per hour or 11,000 B. T. U. is applied to supply part of the radiation of the room to the outside and is deducted from the heat losses in Col. K.

The total heat requirements in Table I are made up of the room losses less the heat supplied by the occupants; the heat required to raise the moisture in the entering air to 70° F. (Col. J) and that required for the dry air (Col. L). These totals are multiplied by the hours in Col. B for each period, and are given in Col. N as 49,253,216 B. T. U.

In all school buildings of any size, power has to be provided for driving fans, air washer pumps, etc., and the amount of exhaust steam available can be used for heating, as it is generally less than the heating requirements during sessions when the outside temperature is below 50° F.

The horse power required for 1,600 cu. ft. of air supplied and exhausted, is assumed as ¼ H. P. per 1,000 cu. ft. of air per minute or a total of 0.8 H. P.

Assuming 60 lbs. per horse power, 900 B. T. U. as the available heat per pound of exhaust steam, the available B. T. U. in exhaust steam for heating purposes will be:

0.8 H.P. × 900 B. T. U. × 60 lbs. = 43,200 B. T. U. per hour.

If outside current is used for power, the K. W. hours per season will be, for the fans:

1,234 hours × 0.8 × 0.75 = 740.4 K.W. hours per season and at 5 cents per kilowatt hour,

$$740.4 \times 5c. = \$37.02.$$

In Table I the exhaust steam becomes greater than that required for heating in the last two periods of Cols. O and P, making an additional fuel charge of 21,212,024 B. T. U. This fuel charge would be omitted in the case of employing outside current. In all cases 9 lbs. evaporation per pound of coal from and at 212° F.; 970 B. T. U. as the latent heat per pound of steam, 2,000 lbs. of coal to the ton and $4.00 per ton are assumed in reducing the B. T. U. to dollars and cents.

In Table II, involving the humidifying of the air, conditions, time, etc., are assumed exactly as in Table I, except that the room temperature is reduced to 67° F. and additional moisture is added to make the humidity 4 grains per cubic foot, or 50° dew point and 50% relative humidity at 67° F.

In conditioning air with an air washer, the regulation is obtained by the saturation of the air at some fixed lower temperature known as the dew point or 50° F. in this case, and then supplying heat to the air to raise it to the room temperature and proper percentage of relative humidity.

The air washer is advantageous wher-

TABLE II

RELATIVE HUMIDITY 50%-ROOM 67°F.-OUT DOOR AIR

2-3 WATER FOR AIR WASHER RECIRCULATED

DEW POINT 50° F. 4 GRAINS MOISTURE PER CU.FT.

Outside Temperature Degrees F	Hours each Period	Proportion Heat Loss Each Period.	Percentage Heat Loss Each Period.	Temperature Rise of Air Degrees F.	Grains Moisture per Cu. Ft. Entering Air	Relative Humidity Entering Air	Grains Moisture Per Cu. Ft. to be Added.	Pounds Moisture to be Added per Hour.	B.T.U. for Moisture in Entering Air	Heat Loss each Period B.T.U. per Hour.	B.T.U. for Evaporation Moisture from Water 50°F per Hour.	Pounds of Water to Supply Vapor	B.T.U Per Hour for Dry Air	Total B.T.U. for all Puposes per Hour	B.T.U per Season All Purposes.	B.T.U. for Power in Excess of Heating With Air Washer	B.T.U for Power in Excess of Heating Steam for Vapor.
A	B	C	D	E	F	G	H	I	J	K	L	M	O	P	Q	R	S
							4GR − Col.F	Col.H × 13.7	Col.E Col.F × 6.2	Col. D × 43500 BTU	Col. H 1071 × B.T.U. 13.7	Col. I × Col. B	Col. E × 1824	Col.K+Col.J +Col.L+Col.O − 11000 BTU	Col.P × Col. B	55100 BTU − Col.P × Col.B.	43200 BTU − Col.P × Col.B
0-10	5	62/80	77.5	62	.25	60	3.75	51.4	96	33712	55023	257	113088	190920	954600	—	—
10-20	27	52/80	65.	52	.50	60	3.50	48	162	28275	51355	1296	94848	163640	4,418280	—	—
20-30	110	42/80	52.5	42	1.00	60	3.00	41	260	22837	44181	4510	76608	132886	14,617,460	—	—
30-40	270	32/80	40.	32	1.25	50	2.75	38	248	17400	40350	10260	58368	105366	28,448820	—	—
40-50	180	22/80	27.6	22	1.75	50	2.25	31	240	12000	33014	5890	40128	74382	14,132,580	—	—
50-60	232	12/80	15.	12	2.50	50	1.50	24	186	6525	22090	5568	21888	39689	9,207,848	3,575,352	814,552
60-70	400	2/80	2.5	2	3.00	45	1.00	14	35	~~1000~~	14673	3600	~~3648~~	14708	5,883,200	16,156800	11,369800
TOTAL	1234											33,381			77,662,788	19,732,152	12,184,352

Power for Air Washer: Water = 5 Gallons per 1000 Cu.Ft per Minute

1600 Cu.Ft per Minute requires 8 Gallons × 8⅓ Lbs = 66.6 Lbs per Minute: 50' Head.

$\frac{66.7 \times 50'}{33000 \text{ ft. lbs}}$ = .101 H.P. @ 50% Efficiency = .202 H.P. + .8 for Fans = 1.02 H.P.

Total Heat Exhaust Steam 1.02 H.P × 60 lbs × 900 B.T.U = 55100 B.T.U per Hour

1.02 H.P × .75 × 1234 Hours = 944 Kilowatt Hours per Season.

Power With Steam Vapor for Humidity 7404 K.W. Hours per Season.

Heating Fuel $\frac{77662.788 \text{ B.T.U.}}{970 \text{ B.T.U} \times 9 \text{ lbs} \times 2000 \text{ lbs.}}$ = 4.45 Tons @ $4. = $17.80

Fuel for Power with Air Washer $\frac{19,732,152 \text{ B.T.U.}}{9 \text{ lbs} \times 970 \text{ B.T.U} \times 2000 \text{ lbs.}}$ = 1.13 Tons @ $4 = $4.52

Fuel for Power with Steam Vapor for Humidity $\frac{12,184,352 \text{ B.T.U.}}{9 \text{ lbs} \times 970 \text{ B.T.U} \times 2000 \text{ lbs}}$ = .689 Tons @ $4. = $2.80

Cost Current with Air Washer 944 K.W.H. @ 5¢ = $47.20

Cost Water for Moisture @ $1 per 1000 Cu.Ft. $\frac{3381 \text{ lbs}}{625 \text{ lbs} \times 1000}$ = $.534

ever the entering air is dirty, as in many cities. It is installed mainly to remove soot and cleanse the air and the conditioning is an incidental result obtained at the same time.

Where a building is situated in the open country or the air supply is taken from the roof level, the air washer may be rendered unnecessary, and the steam vapor may be utilized to provide a proper percentage of relative humidity. The expense, as far as fuel and water are concerned, is the same to produce like results, but the first cost of the air washer and power to circulate the water is eliminated.

The power for circulating the water for the air washer has been assumed as follows: 5 gals. per minute per 1,000 cu. ft. of air per minute against a total of 50 ft. head, with an efficiency of 46%. For 1,600 cu. ft. per minute:

$$\frac{8 \times 8 - 1/3 \text{ lbs.} \times 50 \text{ ft.}}{33{,}000 \text{ ft.-lbs.} \times 0.46} = 0.22 \text{ H.P.}$$

The B. T. U. from fans and air washer available in the exhaust as before will be:

(0.8 + 0.22) H.P. × 60 lbs. × 900 B. T. U. = 55,100 B. T. U. per hour.

The kilowatt hours and cost of outside current will be, with the air washer.

1,234 hours × 1.02 H.P. × 0.75 = 944 kilowatt hours.

944 K.W.H. × $0.05 = $47.20 per season per classroom.

The necessary items requiring heat for the air washer using all outside air are as follows in Table II:

Radiation from room, Col. K.

Heat for raising the vapor of entering air, Cols. E, F, J.

Heat for evaporating the additional moisture, Cols. H, L.

Heat for dry air, Cols. E and O.

Cols. P and Q give the total heat per season required as: 77,662,788 B. T. U., as against 49,253,216 B. T. U. for Table I, or 50% more.

The additional heat for exhaust steam in warm periods is given for the air washer in Col. R and for the use of vapor in Col. S. There will also be a water charge in both cases for supplying the vapor and additional moisture of 33,381 lbs. of water per season at $1.00 per 1,000 cu. ft. amounting to $0.534 per classroom.

This increase in heat requirements is the cause of the agitation for recirculation of the air in extreme weather. It has been stated in some catalogues by air washer advocates that there was some compensation due to the possible lower room temperatures when humidity was provided.

In period 0° – 10° (Table I, Col. M) the heat requirements are 143,000 B. T. U. and (Table II, Col. P) 190,920 B. T. U. per hour. The radiation of the room and increase of temperature for dry air in Table II is, net, 190,920 – 55,023 B. T. U. = 135,897 B. T. U., a decrease of 7,103 B. T. U., due to lowering the room temperature, while the vapor (Col. L) requires an addition of 55,023 B. T. U. for evaporating the required moisture.

Table III gives the data for recirculating the air of the room to produce the same results as Table II, using water as a cooling agent and outdoor air above the 50°—60° F. period.

RECIRCULATED AIR MUST BE DEHUMIFIED.

Recirculation requires that the products thrown off by the bodies should be removed from the returning air to the washer and the air has to be dehumidified each time it passes to again adjust it for reconditioning. The operation requires the air to be cooled from 67° F. to 50° F. and then reheated to 67° F. and 50% relative humidity. If water is available at a sufficiently low temperature below 50° F., it may be used through the washer and wasted as it becomes heated.

The heat of the pupils is used to supply room radiation losses as before. This method is independent of conditions of outside temperature and relative humidity.

The heat requirements are given in Table III, Cols. B, F, and G, as 37,976,625 B. T. U., less than one-half of what were required in Table II, or 77,662,788 B. T. U., which explains the argument for recirculation. The B. T. U. for cooling and heating 1,600 cu. ft. of air per minute and 4 grains moisture per cubic foot are as follows, from 50° to 67° F.

	B. T. U. per hour
1,824 constant × 17° = ...	31,000
13.7 constant × 4 gr. × 7.6 = ..	4,165
Total	35,165

TABLE III

4- ALL AIR RECIRCULATED- COOLING BY WATER

5-AIR PARTLY RECIRULATED- COOLING BY OUTSIDE AIR

ROOM 67° F. ; RELATIVE HUMIDITY 50% ; DEW POINT 50° F.

Heat Required for Condensation of Moisture from Pupils
Water Vapor from Skin: 24 Hours 2 lbs. per Pupil
2/24 x 40 = 3.333 lbs. per Hour
Vapor from Breath; 1.46 Cu.Ft. .0015 lbs x 40 = .0673 lbs
.0673 lbs + 3.333 = 3.4 lbs. per Hour
Total B.T.U Vapor 67° F. 1090 Less B.T.U. Liquid 50°-18 = 1072
3.4 lbs x 1072 = 3650 B.T.U. : 275 B.T.U x 40 = 11000 B.T.U.

.6 Cu.Ft. x 40 Pupils = 24 Cu.Ft. CO_2 per Hour
24 Cu.Ft. Oxygen Vitiated x 5 = 120 Cu.ft. Air per Hour to replace this amount.
B.T.U. For Heating or Cooling 1600 Cu.Ft. Dry Air 50° to 67° F. = 1824 x 17° = 31000 B.T.U.
4 Grains Moisture 58 to 67° F.
13.7 x 4 x (1089 B.T.U. - 1081.4) = 4165 "
35165 B.T.U.

Outside Temperature Periods Degrees F.	Hours Each Period	Proportion Heat Loss	Percentage Heat Loss	B.T.U. Loss per Hour Each Period	Total B.T.U. per Hour Required Each Period	Total B.T.U. per Period and Season	B.T.U. for Power in Excess of Heating per Hour	Total B.T.U. for Power in Excess of Heating per Season	Total B.T.U. for Cooling Required per Season	Cooling Effect of 1000 Cu.Ft. per Minute of Outside Air — B.T.U. per Hour: Raise in Temperature to 50 Degrees F.	Relative Humidity Entering Air	Grains Moisture per Cu.Ft. Entering Air	Grains to be Added per Cu.Ft. Air	B.T.U. to Raise Temperature One Degree Entering Air	B.T.U. to Evaporate Moisture from Water 50° F.	B.T.U. Required for Dry Air	Total B.T.U. to Raise 1000 Cu.Ft. per Minute 20 to 50 Deg. F.	Cu.Ft. Air per Minute to Reduce Total to 50° F.	Percentage of Air Hour Outside	Percentage of Air Recirculated	Water Required to Remove CO_2 from Recirculated Air	B.T.U. for Heating per Season: Last 2 Periods Table II Col Q	B.T.U. for Power in Excess of Heating Air Washer	B.T.U. for Power in Excess of Heating Steam for Humidity	Lbs. Water for Vapor for Outsid. r Air
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
				43500 B.T.U. x Col. D	35165 - 11000 B.T.U. + Col. E	Col. F x Col. B	55100 B.T.U. - Col. F	Col. H x Col. B	35165 + 3650 B.T.U. x Col. B		%		4 - Col. M	4.02 Col. K	1063 B.T.U. x 8.56 x Col. N	Col. K x 1140 B.T.U.	Col. O + Col. P + Col. Q	38915 - Col. R / 1600 = Col. S	Col. S ÷ 1600	1 - Col. T	24 Cu.Ft. x Col. U x Col. B	Col. G and Col. Q Table II	Col. I and Col. R Table II	43200 B.T.U. - Col. F x Col. B Col. R Table II	Col. M Table II x Col. T - 3.4 x Col. B Col. M Table
0°-10°	5	62/80	775	35712	57877	289385	—	—	194075	45°	60	.25	375	45	34125	51300	85470	354	2213	7787	93.6	289385			40
10°-20°	27	52/80	65	28275	52440	1415880	2660	71820	1048005	35°	60	.50	350	70	31850	39900	71820	404	2525	7475	486.	1415880	71820		235
20°-30°	110	42/80	525	22875	47038	5174180	8062	886820	4269650	25°	60	1.00	300	100	27300	28500	55900	484	3025	6975	1848.	5174180	886820		990
30°-40°	270	32/80	40.	17400	41565	11222550	13535	3654430	10480050	15°	50	1.25	275	75	25025	17100	42200	584	36.5	63.5	4115.	11222550	3654430	441430	2827
40°-50°	190	22/80	276	12000	36165	6871350	18935	3597650	7374850	5°	50	1.75	225	35	20473	5700	26208	770	4813	5187	2371.2	6871350	3597650	1336650	2190
50°-60°	232	12/80	15.	6525	30690	7120080	24415	5664280	9005080													9207848	3575350	814552	5568
60°-70°	400	2/80	.025	1090	14708	5883200	40392	16156800	—													5883200	16156800	11369800	5600
TOTAL	1234					37,976625		30,031,820	32,371,710												8914	40,064,393	27,942,890	13,962,452	17450

All Air Recirculated - Cooling By Water with Air Washer

Heating Fuel $\frac{37,976625 \text{ B.T.U.}}{9 \times 2000 \times 970 \text{ B.T.U.}}$ = 2.18 Tons Coal @ $4 - $ 8.72

Excess Fuel Power $\frac{30,031,820 \text{ B.T.U.}}{9 \times 2000 \times 970 \text{ B.T.U.}}$ = 1.72 Tons Coal @ $4 - $ 6.88

Water for Cooling $\frac{32,371,710 \text{ B.T.U.}}{10 \times 62.5 \text{ lbs} \times 1000}$ = 5.18 M Cu.Ft @ $1 - $ 5.180

Power without Air Washer 740.4 K.W.H. @ 5¢ $ 37.02
" with " " 944 K.W.H. @ 5¢ $ 47.20

Air Partially Recirculated Cooling by Outside Air

Heating Fuel $\frac{40,064,393 \text{ B.T.U.}}{9 \times 2000 \times 970 \text{ B.T.U.}}$ = 2.295 Tons Coal @ $4. $ 9.18

Excess Fuel Power, Air Washer $\frac{27,942,890 \text{ B.T.U.}}{9 \times 2000 \text{ lbs} \times 970 \text{ B.T.U.}}$ = 1.60 Tons Coal @ $4 - $ 6.40

Water Wasted Removing CO_2 $\frac{8,914 \text{ Cu.Ft.}}{1000 \text{ Cu.ft}}$ = 8.91 M Cu.ft @ $1 - $ 8.91

Useing Steam for Vapor No Air Washer
Excess Fuel for Power $\frac{13,962,452 \text{ B.T.U.}}{9 \times 2000 \times 970 \text{ B.T.U.}}$ = .8 Tons Coal @ $4 $ 3.20
Water for Vapor $\frac{17450 \text{ lbs}}{62.5 \times 1000}$ = .28 M. Cu.ft. @ $1 $ .28

The heat from the exhaust steam from power is given in Table III, Col. I. Note that the exhaust steam furnishes a surplus for all periods except 0° to 10° F.

VAPOR FROM BODIES OF PUPILS MUST BE CONDENSED.

In addition to the 35,165 B. T. U. per hour that will have to be abstracted from the returning air, the vapor produced from the bodies will have to be condensed, or the per cent. of humidity of the room will be increased. Each pupil gives off about 2 lbs. of moisture per 24 hours from the body, and 1.46 cu. ft. of moisture from the breath at 70° F. per hour. The 40 pupils will give off per hour:

$$\frac{2}{24} \times 40 = 3.33 \text{ lbs. per hour.}$$

1.46 cu, ft. × 0.00115 lbs. per cu. ft. × 40 = 0.0673 lbs. from the breath.

3.4 + 0.0673 lbs. × (1,090—18) = 3,650 B. T. U. per hour.

1,090 B. T. U. = total heat of steam at 70° F. and 18 B. T. U., the heat of the liquid at 50° F.

The total cooling effect per hour will be:

35,165 B. T. U. + 3,650 B. T. U. = 38,815 B. T. U. per hour.

The total B. T. U. per season to be removed will be found to be, in Col. J, 32,371,710 B. T. U., and if the circulation water can be heated 10° F., or from 40° to 50° F., which is doubtful:

$$\frac{32{,}371{,}710}{10 \times 62.5 \text{ lbs.} \times 1{,}000} = 51.8 \text{ M. cu.}$$

ft. of water will be required. If the temperature of the water is higher than 40° F., which is probable, it will take a greater amount.

Water is charged in most places at $1 per M. cu. ft., so that this expense would be, per classroom, $51.80, or more than ten times the fuel for heating in Table II.

This, of course, is prohibitive. Any cooling agent may be used, as an ice machine, but the fuel saving over the use of all outdoor air would not warrant any such expenditure.

The only remaining remedy and the natural one will be to utilize outside air to dilute that recirculated, removing an equal quantity in order to produce the cooling effect. The heat requirements will be just the same as in Col. G, Table III, for the first five periods below 55° F., and the last two will require outside air, the same as Col. Q, Table II, all shown in Col. W, Table III.

Col. X in like manner shows the extra steam required if exhaust is used for heating, as there is a surplus in most cases. This surplus steam for power would be eliminated if outside current were used.

Col. V also shows the extra steam for power if vapor is used for humidity instead of an air washer.

It is suggested that it might be possible to use some eliminator plates with the cooler outside air to take any surplus moisture from the air, and, in that case, steam could be used to furnish vapor, as there would be little or none required after the first interval of operation. This, of course, would not remove the body products from the air, and neither would the air washer, unless a considerable amount of the circulated water were displaced with fresh water.

Each pupil produces 0.6 cu. ft. of CO_2 per hour, or, for 40 pupils, 24 cu. ft. of CO_2 and a like volume of oxygen will be totally exhausted from the air. As the air is one-fifth oxygen, 120 cu. ft. of fresh air per hour will have to be introduced in any case. If this CO_2 is removed by water, at least an equal number of cubic feet of water will have to be wasted from the air washer.

Cols. K, L, M, N, O, P, Q, R, give the data for raising 1,000 cu. ft. of air and supplying the necessary moisture in B. T. U. in Col. R. If an equal amount of air from the room is displaced per minute, the required cubic feet are given in Col. S, with the percentages in Cols. T and U.

This shows 354 cu. ft. per minute of outside air at 0°—10° F. will have to be used to 770 cu. ft. at 40° to 50° F.

If a corresponding amount of water is wasted from the washer to the volume of CO_2 produced, the water requirements will be in Col. V as 8,914 cu. ft. or a charge of $8,914. If no water is removed from the air washer, it is difficult to see how the purity of the air is to be maintained even with the mixture of outside air. Water circulated in the washer

is limited to comparatively few cubic feet, or to the contents of piping, washer, heater, etc.

Col. Z shows the pounds of water used for vapor in the outside air introduced, as vapor will have to be supplied to make a standard of 4 grains per cubic foot.

In recirculation, all returned air has to be cooled and heated, and impurities should be removed. It, therefore, follows that if the cubic feet of air circulated per minute per pupil are increased, there is greater cost of operation without any adequate benefit, as the impurities to be removed remain exactly the same regardless of the quantity of air recirculated. If these impurities are removed, there would be no adequate reason why the volume of air should be increased over 30 cu. ft. per minute per pupil where recirculation is contemplated.

Table IV gives all results in dollars and cents, tabulated in conveniene form for comparison. The results show that some methods would give greater economy of fuel and water with outside current than with an isolated plant on the premises.

The margin per classroom in Col. H. would seem to indicate a greater possibility of saving by the use of the isolated plant on larger buildings than the use of a recirculating system over all outdoor air.

The discussion of this subject involves generally methods 2 and 5 and the results show practically no difference in cost. If the water in the air washer is used over and over, the conditions would be the same as method 6 as concerns expense of operation.

Col. H is the amount per class-room in any case that might be applied for interest, depreciation and extra labor, if an isolated plant were contemplated and would be determined largely by the size of the building.

Col. A shows a reduction in fuel by recirculation, but practically no reduction in the total expense.

Method 4 is obviously out of the question, unless water or some cooling agent can be furnished for less than the cost of water.

It is the author's opinion that the wisest course is to acknowledge that the air washer has certain advantages, if not necessary features, that involve greater expense of operation, and to set aside the amount required to meet the tax, utilizing all outdoor air. When a variable amount of air has to be added from without for various conditions, the apparatus will not be nearly as fool-proof as when all the air is taken from the same source. *The whole question turns on the expense of water versus the expense of fuel.*

TABLE IV

COMPARATIVE COSTS PER CLASS ROOM

	METHOD OF OPERATION	Number of Table	Fuel for Heating	Water for Humidity and Cooling	Excess Fuel for Power over Heating	Outside Current for Power @ 5¢ per K.W.H.	Cost of Water and Fuel for Heating-Cooling	Cost of Fuel and Water for Heating, Power	Cost of Outside Current, Fuel Heating-Cooling	Amount per Class Room for Interest and Depreciation on Isolated Plant
			A	B	C	D	E A+B	F A+B+C	G A+B+D	H G-E
1	ALL OUT DOOR AIR ROOM 70°-NO HUMIDITY	I	$11.28	$——	$4.86	$37.02	$11.28	$16.14	$48.30	$32.16
2	ALL OUT DOOR AIR ROOM-67° 50% HUMIDITY. SUPPLIED BY AIR-WASHER	II	17.80	.534	4.52	47.20	18.334	22.854	65.534	42.68
3	ALL OUT DOOR AIR ROOM 67° 50% HUMIDITY SUPPLIED BY STEAM VAPOR	II	17.80	.534	2.80	37.02	18.334	21.134	55.354	34.22
4	RECIRCULATION TO 60° 70° OUTSIDE: COOLING BY WATER USING AIR-WASHER	III	8.72	51.80	6.88	47.20	60.52	67.40	107.72	40.32
5	PARTIAL RECIRCULATION COOLING BY OUTSIDE AIR USING AIR WASHER	III	9.18	8.91	6.40	47.20	18.09	24.49	65.29	40.80
6	PARTIAL RECIRCULATION COOLING BY OUTSIDE AIR HUMIDITY SUPPLIED BY STEAM	III	9.18	.28	3.20	37.02	9.46	12.66	46.48	33.82

Mechanical Equipment for a Modern Hostelry

THE NEW HOTEL GIBSON, CINCINNATI, O.

Sixty-five years ago the Gibson House, of Cincinnati, was the last word in hotels of that day and was equipped with every convenience then known. Forty years ago it had so far outgrown its facilities that entire remodeling and a 50% increase in capacity was necessary; at this time it again earned the reputation of not only being the most modern hotel of its day, but of being one of the largest west of New York.

For the third time in its history the title of "The Perfect Hotel" is again assumed. The Hotel Gibson stands well to the front in the highest class to-day as a result of a complete rebuilding following a fire which destroyed it January 24 of last year. Thirteen and one-half months after the fire it was formally opened to the public. The speed with which the reconstruction took place coupled with the care exercised in every detail is in itself a tribute to the owners, architects, engineers and builders.

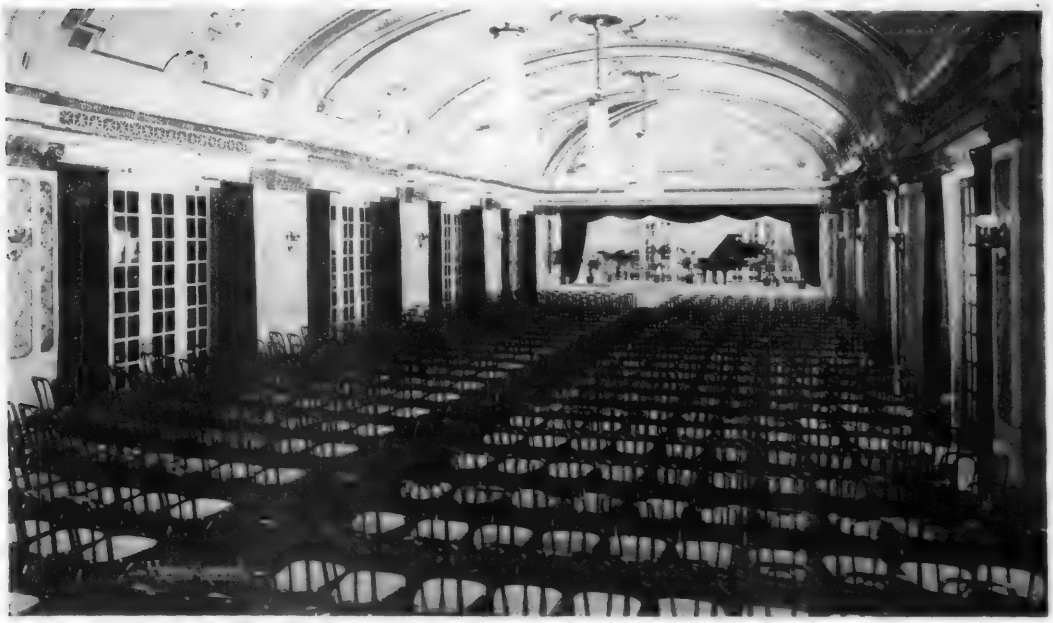
Gustave W. Drach of Cincinnati is the architect of the hotel and in conjunction with J. Stacy Hill, president of the Hotel Gibson Company, and Geo. W. Martin, manager, plans were conceived which resulted in a building not only beautiful throughout, but practical in arrangement from the viewpoint of the hotel management.

In the incorporation of the latter feature Architect Drach was able to draw on the experience of hotel people who were familiar with the requirements of the long-established clientele; so that a house has been built to suit its known patrons.

The hotel is a 12-story structure, the basements of which extend 54 ft. below the street level. The building houses its own power plant and it comprises equipment of the very latest type. Bert L. Baldwin and Company, Cincinnati, were the engineers, and the care in selection and co-ordination of the apparatus necessary to meet the complex requirements of a hotel, will be at once apparent to those familiar with such equipment. In the selection of apparatus the owners were farsighted in authorizing the engineers to be guided chiefly by durability and efficiency so as to secure dependable equipment which would be economical in the long run.

The power plant is located in the sub-basement. There are three 300 H.P. horizontal water tube boilers of the B. & W. type, built by the Tudor Mfg. Co., of Cincinnati. Each is equipped with an automatic stoker made by the Murphy Iron Works, Detroit, and with Vulcan Soot Blowers which permit cleansing of the boiler tubes without opening the cleaning doors. The equipment is also arranged so that the boilers can be fired with natural gas. An open feed-water heater made by the Cookson Steam Spe-

Architect, Gustave W. Drach.
THE NEW HOTEL GIBSON, CINCINNATI, OHIO.



BALL ROOM AND MAIN AUDITORIUM, HOTEL GIBSON.

cialty Company, of Cincinnati, acts as a receiver for the condensation from the heating system and high pressure drips, and also warms the "make up" water with exhaust steam. Duplicate 7½-in. x 4½-in. x 10-in. Worthington duplex pumps feed the boilers from the heater.

Electric power and light are furnished by three generating units, one 150-K.W. for small loads and two 200-K.W. for heavy loads. The overload capacities of these units are such that any two can handle the maximum load in case the third is out of commission. The generators are wound for 250 volts direct current and were built by the Triumph Electric Company, of Cincinnati. Each is direct-connected to a steam engine of the releasing gear Corliss type, built by the Hoover, Owens, Rentschler Company, Hamilton, Ohio.

The hotel is so wired that all motors

MAIN LOBBY, HOTEL GIBSON.

FOUNTAIN ROOM, HOTEL GIBSON.

are supplied with current at 250 volts, while the lighting circuits are operated on the 3-wire system. Two 30-K.W. Triumph balancer sets are installed to equalize the load on the circuits.

The switchboard contains all necessary instruments for controlling the operation of the generator and balancer sets, handling and distributing current and for recording the amount of current consumed in each service. The generator busbars are connected to the feeder busbars by double-throw switches which also permit of current being taken from a feeder cable of the Union Gas and Electric Co., in emergency. The main switchboard, feeder panels, wiring, etc., were furnished and installed by Alexander Schulman, Chicago, Ill.

Filtered city water is delivered to steel tanks in the attic by means of two motor-driven, geared, triplex pumps, of Fairbanks, Morse & Co., make. Their operation is controlled by float switches connected to the tanks.

Two hot water heaters, built by the

BILLIARD ROOM, HOTEL GIBSON.

MAIN DINING ROOM, HOTEL GIBSON.

Alberger Condenser Company, utilize exhaust steam for supplying hot water to plumbing fixtures. The water temperatures is maintained constant by thermostats.

The boiler room is some 20 ft. below the city sewer level, so that sewage ejectors in duplicate had to be installed. These were furnished by the Shone Co., Chicago. Each consists of a normally-vented cast-iron receiver into which sewage flows through check valves until a certain level is reached, at which point a float operates a valve mechanism which closes the vent and admits compressed air to the receiver, thus forcing the sewage up to the city sewer. At a certain low level the action of the valve mechanism is reversed and the apparatus is again ready to receive sewage. Duplicate motor-driven air compressors supply air at 50 lbs. pressure for this purpose.

The refrigerating apparatus consists of two steam-driven Triumph ammonia compressors and the necessary auxiliary

ENGINE ROOM, HOTEL GIBSON.
Chief Engineer, Grant Kelley.

BOILER ROOM, HOTEL GIBSON, SHOWING FRESH AIR INLETS.

apparatus for the production of 25 tons of ice per day as well as to furnish refrigeration for the various cold storage rooms, ice boxes and refrigerators throughout the entire building. In addition, an ice-water equipment and circulating system supplies service rooms on each floor and the fountains in the public rooms of the hotel.

FRESH-AIR SUPPLY SYSTEM.

The basement, first floor, mezzanine and second floor which contain the large public rooms are heated and ventilated by the hot blast system. The three main ventilating units are 15,000, 16,000 and 18,000 cu. ft. of air per minute capacity and each consists of a multivane fan built by the American Blower Company, and driven by a variable speed motor. The fans draw air from a common shaft. through Vento tempering coils having a capacity for warming the air about 50° F., thence through an air washer where all dust, dirt, etc., are removed and a proper degree of humidity or cooling imparted as the season may require. The air next passes through Vento reheating coils from which the fan delivers it to the rooms through metal ducts.

Thermostats suitably located maintain constant temperatures throughout the areas supplied by each fan through control of the exhaust steam to reheating coils. All thermostatic devices were furnished by the Johnson Service Co., Milwaukee, Wis.

PROVISIONS FOR COOLING AIR IN SUMMER.

The installation of elaborate air conditioning apparatus is an index of just how careful the owners have been to provide every modern device making for the comfort of their patrons. The air washers were of a special design so as to permit of cooling the air in summer by means of ice.

Each air washer consists of a casing enclosing a series of nozzles from which issues a maze of mist and fog. The air is drawn through this spray and cleansed of all solid matters. The excess moisture is removed from the air as it passes through a series of horizontal baffle plates forming the eliminator. The moisture removed is returned to a special tank extending under the entire washer, from which it is drawn through a brass strainer by means of a centrifugal pump and returned to the spray nozzles at a pressure of about 20 lbs.

The air washers are constructed of

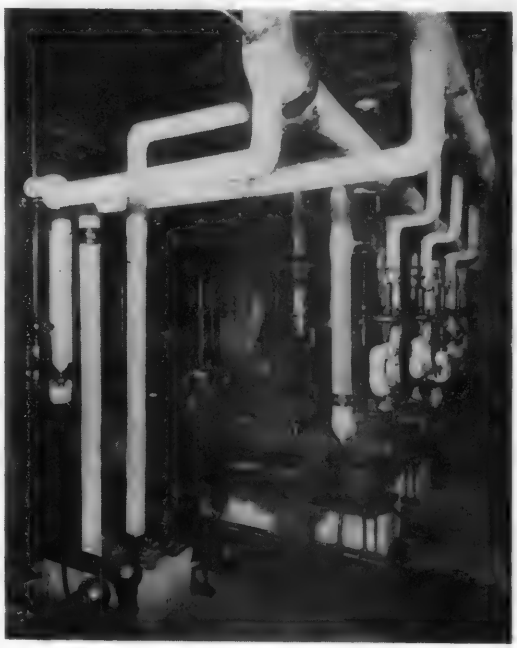
ONE OF THE AIR WASHERS, HOTEL GIBSON.

heavy gauge galvanized American ingot iron braced with galvanized angles throughout. The brass spray nozzles are of a type which utilize centrifugal action and interference of water jets to secure fine atomization of spray water. Within each nozzle is a spirally cored interior which divides the water into two separate streams which leave the cored interior tangentially and at diametrically opposite points; the rotary motion given the two jets as they strike the interior of the nozzle housing coupled with their interference in the throat of the 3/16 in. nozzle orifice breaks up the spray water and forms a cone-shaped mass of fog. The generous discharge orifice and ample strainer facilities are designed to prevent the clogging of the nozzles and the impairment of efficiency thereby. Glass-panelled cast-iron doors set in the casings afford means of access to and inspection of the interior.

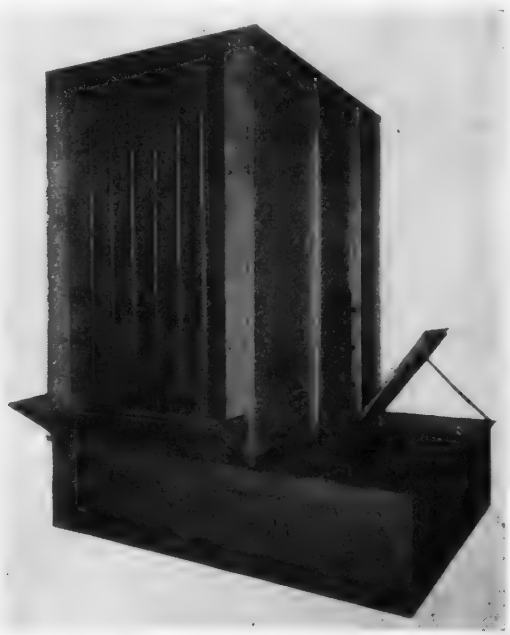
AIR WASHER ROOM, SHOWING CIRCULATING PUMP AND WATER AND AIR RELIEF VALVES FOR DRIPPING HEATER.

ARRANGEMENTS FOR COOLING AIR IN SUMMER.

The tanks under each air washer are of special depth for the reception of refrigerating coils and in addition have an extension at the side for the reception of ice during periods of extreme hot weather or on the occasion of large assemblages in the rooms to which air is supplied. The ice compartments have hinged lids insulated with mineral wool, and are water-sealed from the main body of the tank so that the compartments may be filled or inspected while the apparatus is in operation without ingress of air from the basement.



PUMP ROOM, SHOWING VACUUM PUMPS IN CONNECTION WITH HEATING SYSTEM.



VIEW OF SPECIAL AIR WASHER, SHOWING ONE OF THE THREE-HINGED LIDS TO TANK EXTENSION OPEN FOR RECEPTION OF CRUSHED ICE.

The centrifugal pumps are of the single-suction type built by the Platt Iron Works Company,. Dayton, O. Each pump is direct-connected to a Fort Wayne electric motor which is equipped with a Cutler-Hammer starter; pump and motor are mounted on a single cast-iron bed plate with oil rim around same.

Within each tank is an automatic ball float valve for maintaining a constant water level by the introduction of fresh water to replace that lost by evaporation. Suitable overflow and drain fittings are provided, as well as lengths of hose with proper fittings for facilitating the cleansing of the entire apparatus.

HUMIDITY CONTROL APPARATUS.

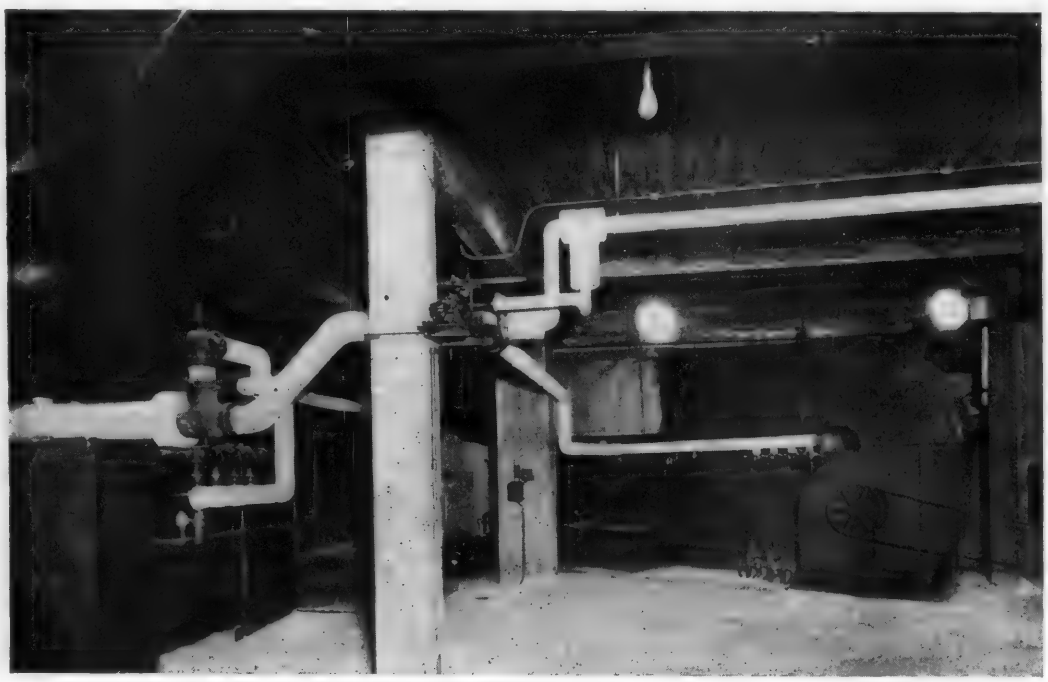
Each air washer is equipped with a system for controlling humidity during the heating season, and is of a type particularly adapted to the requirements in that it can be so adjusted that the humidity may be maintained constant or, if desired, automatically reduced after the outside temperature reaches a certain point, thereby preventing condensation of moisture on the cold windows, which would run down on the woodwork or else frost heavily and so cut off the view of the street.

Control is secured by means of a thermostat in the outlet of each air washer subject to the air temperature at that point which controls the supply of exhaust steam to the tempering coils, while the water temperature is held constant by the introduction of live steam to the spray water through submerged steam and water mixers of a noiseless type, the steam supply to which is controlled by a water temperature regulator in the tank.

IMPORTANCE OF VENTILATION IN GRILL AND OTHER BASEMENT ROOMS.

The importance attached to the question of ventilation as viewed by the hotel management, when the whole proposition was being planned may be summed up in a few words, viz.: that the success or failure of the grill rooms, etc., from a financial standpoint, hung upon the temperature conditions within the rooms.

The fountain room has the air changed six times per hour; other basement rooms four times per hour. Seventy-five per cent. of the air entering the basement is drawn out by exhaust fans, the balance being forced into the kitchen and lobby café. The first floor dining-room and second floor bar have four air changes per hour; the main lobby re-



VIEW SHOWING TWO VENTILATING UNITS WITH AIR WASHERS, ETC., HOTEL GIBSON.

COMPLETE VENTILATING UNIT, HOTEL GIBSON, SHOWING AIR WASHER WITH SIDE EXTENSION OF TANK FOR RECEPTION OF ICE.

ceives five changes. Various exhaust systems for ventilation of toilets and kitchens are provided.

The air conditioning apparatus was designed and manufactured by Warren, Webster & Company, Camden, N. J.

All rooms above the second floor are heated by direct radiation, utilizing the exhaust steam from the main engines. The Webster vacuum system of steam circulation is used. Each unit of radiation is fitted with an automatic water and air relief valve to permit free passage of the condensation and air from the radiator and to prevent the passage of steam. Over a thousand of these traps are in service. To insure a positive circulation of steam at low initial pressure and quick heating of the radiators, together with speedy return of the products of condensation to the feed-water heater, vacuum pumps in duplicate are installed in order to secure the necessary differential in pressure between the main supply and return lines.

The proper vacuum is automatically maintained constant by means of Webstem vacuum governors which control the supply of steam to the pump and so regulate its speed.

ANOTHER OF THE AIR WASHERS, SHOWING THERMOSTATIC DEVICES FOR HUMIDITY CONTROL.

Prior to the introduction to the heating main, the steam passes through a large Webster oil separator which acts to keep the system free from oil and by purifying the vapor, the condensation with its heat can be returned to the boilers, thus effecting large savings in fuel and city water. The oil separator is dripped through a Webster grease trap.

The heating and ventilating equipment was furnished and installed by Geerin Brothers, of Cincinnati.

The hotel is equipped with a complete system of steel conduits for the electrical systems as well as outlets, pulling and junction boxes and steel cabinets containing distributing panels for the telephone, telegraph, telautograph and fire alarm systems.

The elevator equipment was furnished by the Warner Elevator Co., of Cincinnati, and includes four passenger cars, one baggage and one service elevator. All are electrically operated by motors and winding engines in pent houses on the roof. All are of the latest type and include complete signal systems and all the most modern safety appliances. An automatic supply elevator runs from the basement to the street level. There is also an electrically operated ash hoist, two hand power dumb-waiters and two electrically operated automatic push button service dumb-waiters; these latter run from the basement to the 12th floor.

The hotel is piped throughout for a vacuum cleaning system with convenient outlets for cleaning the rooms. A steam-driven vacuum pump and suitable receiver are located in the sub-basement. The vacuum cleaner was furnished by The Clifton-Pratt Co., Cincinnati, O.

The kitchen and laundry equipments are modern in every detail, and are arranged in a most practical manner. The operation of all equipment has been put in charge of Grant Kelly as chief engineer, which in itself is a guarantee to those who have installed apparatus, that it will receive the skilled attention and care which insures satisfaction to the owners and reflects credit upon engineers and the manufacturers. Well Bros. Co., of Chicago, was the general contractor, and the rapidity and care with which the building was erected is ample evidence of the reason for the long and successful career of this organization. The building was opened two months in advance of the contracted date.

The owners are to be congratulated on the structure which they have reared, which goes far towards realizing their ideal of "The Perfect Hotel."

Architect, Electus D. Litchfield.
THE ST. PAUL PUBLIC LIBRARY, ST. PAUL, MINN.

Photograph Shows both St. Paul Public Library and Hill Reference Library. Portion of building to the right is the St. Paul Public Library.

Example of Modern Heating Practice in the Northwest

EQUIPMENT OF THE ST. PAUL PUBLIC LIBRARY, ST. PAUL, MINN.

The application of a combined direct and indirect heating system in a comparatively cold section of the country is shown in the accompanying plans for the equipment of the St. Paul Public Library, St. Paul, Minn. The many detailed drawings which are included in the illustrations will obviate the necessity for an extended description of the plant, but a few points should be noted in connection with the layout.

The heating system is two-pipe, operating on a vacuum maintained by pumps in the fan room. Steam service is purchased from a local central heating company whose service piping is brought into the building through underground tunnels and vertical shafts. As all condensation from the heating system is paid for at so much per 1000 lbs., cross connections are made so that the hot return water, before entering the vacuum pumps, is pulled through the tubes of the hot water heater, thus utilizing all possible heat from the condensation.

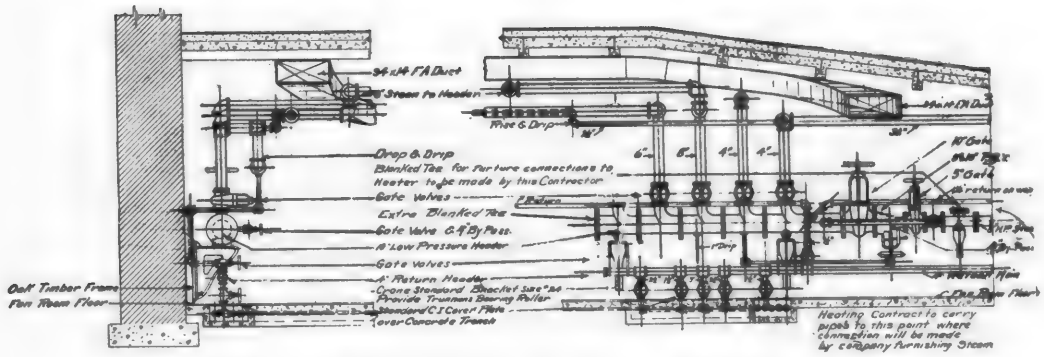
The heating of the building is by direct radiation throughout, with the exception of the main entrance lobby, which is heated by a separate hot blast system, the hot air entering the lobby at a point near the ceiling, as indicated in the details. Temperature regulation is applied to all sections of the ventilating and hot blast systems and to all direct radiation throughout, with the exception of that in the court rooms, vestibules, stair halls and conversation alcove.

As indicated in the plans, the greater portion of the direct radiation is concealed back of registers or grilles. Also, most of the risers and returns are concealed, being run either in chases in the wall or inside of built-out pilasters. Where the rooms are finished in marble, all registers and grilles concealing the radiation are of the electro plate bronze type of special design.

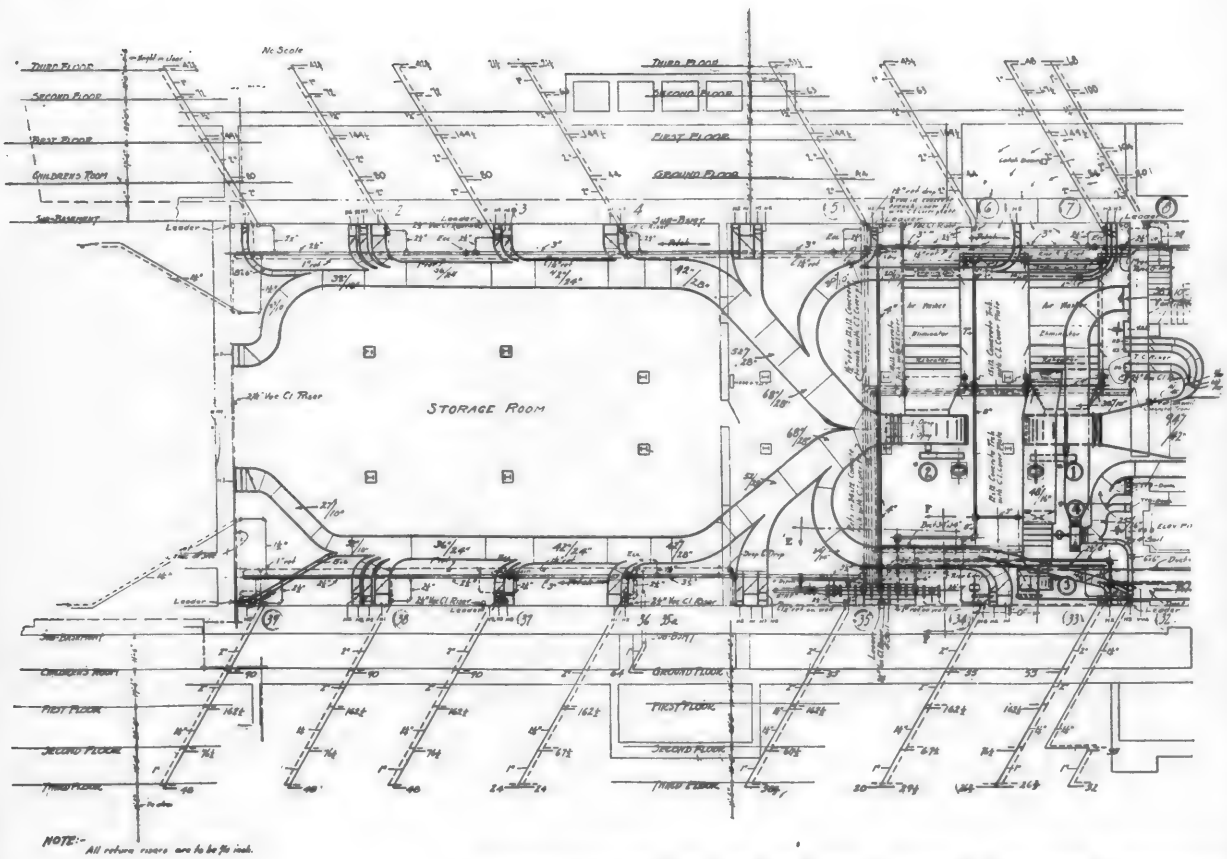
DIVISION OF VENTILATING SYSTEM.

The ventilating system is divided into three units:

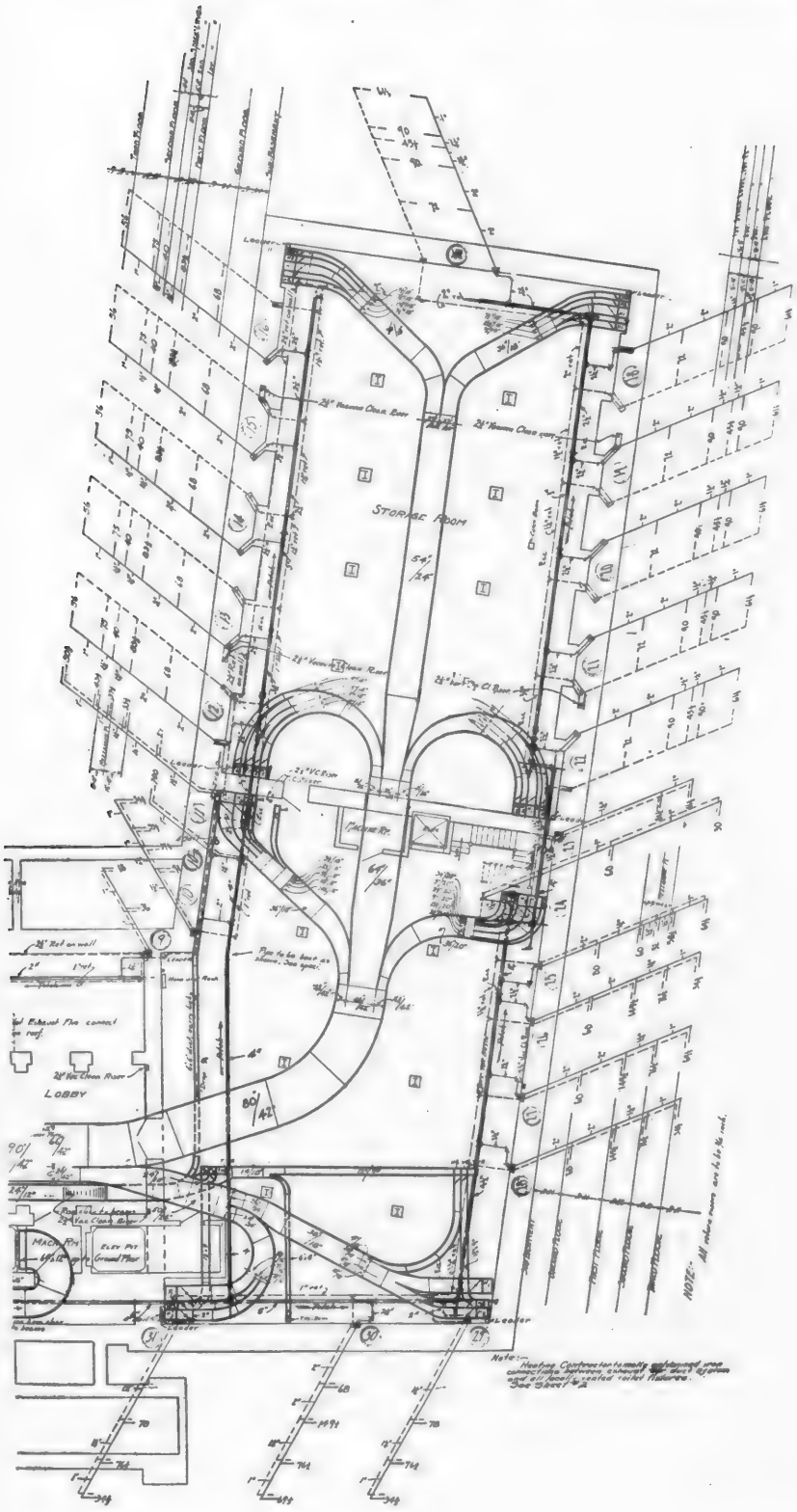
1. General Ventilation. This system is both plenum and exhaust and serves practically all the rooms in the building, except toilets, lobbies, stair halls, vestibules, court rooms, conversation alcove, etc. The plenum fans


Drop & Drip
Blanked Tee for future connections to Heater to be made by this Contractor
Gate Valves
Extra Blanked Tee
Gate Valve C.I. By Pass.
Low Pressure Header
Gate Valves
Return Header
Crane Standard Bracket Size "B4"
Provide Treatment Bearing Roller
Standard C.I. Cover Plate
Over Concrete Trench
Oak Timber Frame
Fan Room Floor
Heating Contractor to carry pipes to this point where connection will be made by company furnishing Steam

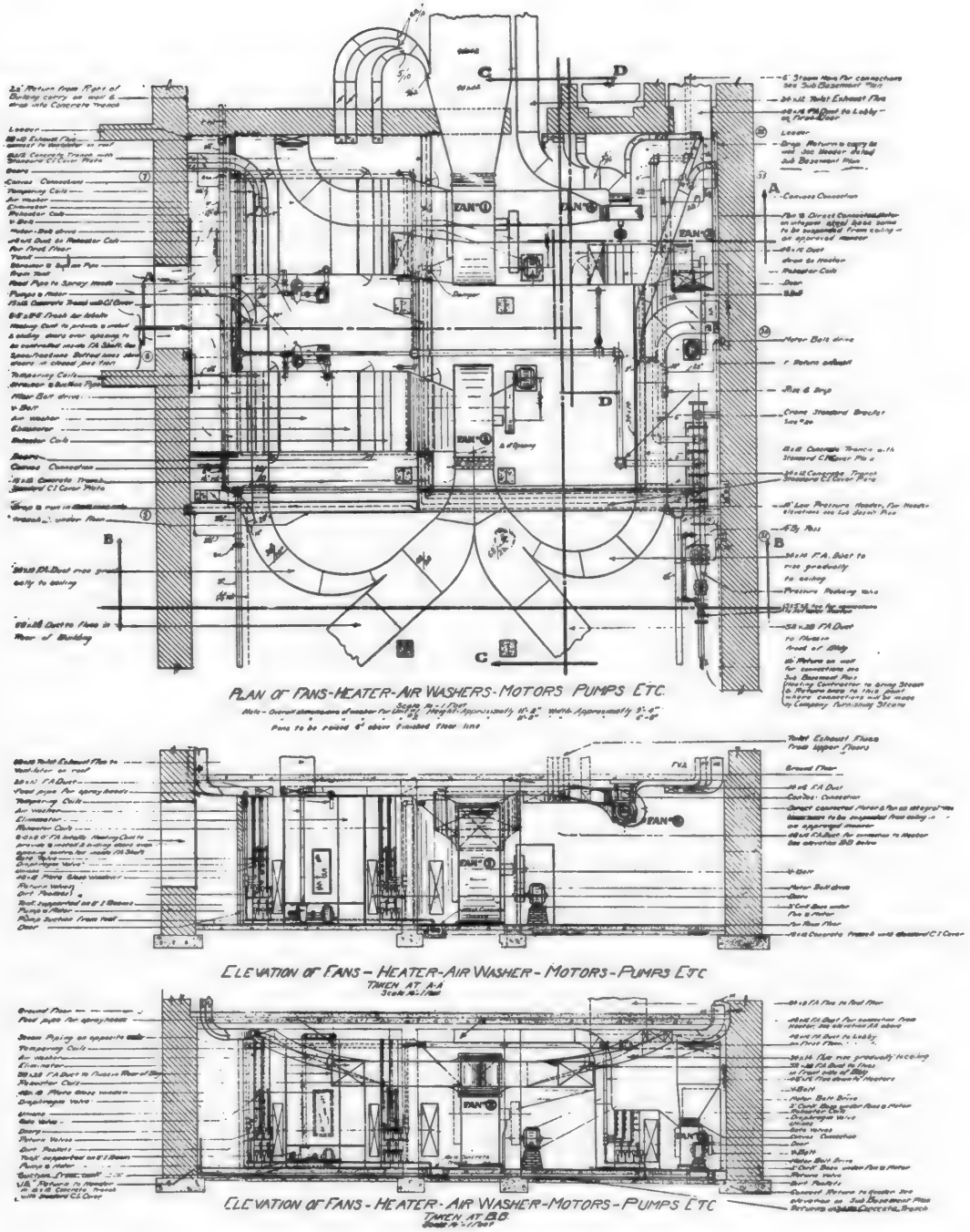
SIDE AND FRONT ELEVATIONS OF STEAM AND RETURN HEADER.



SUB-BASEMENT PLAN, ST. PAUL PUBLIC LIBRARY, SHOWING



PRINCIPAL HEATING UNITS AND AIR DUCTS.


PLAN OF FANS-HEATER-AIR WASHERS-MOTORS PUMPS ETC.
ELEVATION OF FANS - HEATER-AIR WASHER - MOTORS - PUMPS ETC
TAKEN AT A-A
ELEVATION OF FANS - HEATER - AIR WASHER-MOTORS - PUMPS ETC
TAKEN AT B-B

DETAILS OF FANS, HEATER, AIR WASHERS, ETC., ST. PAUL PUBLIC LIBRARY.

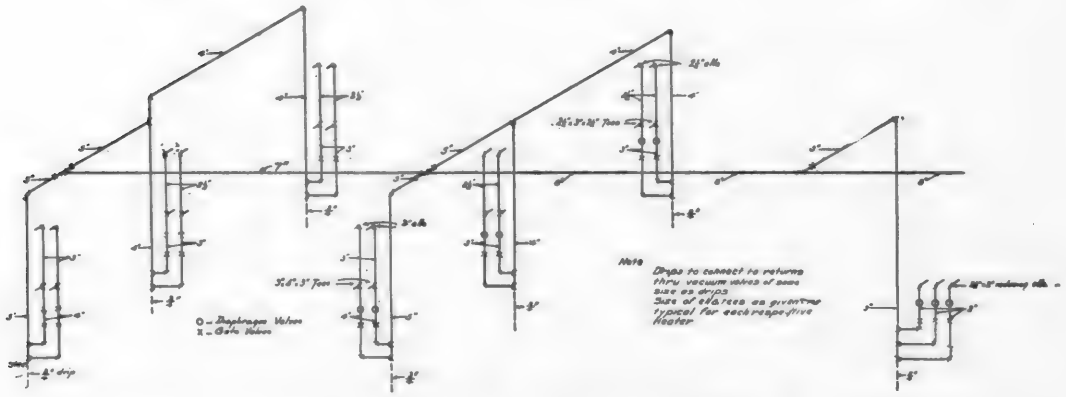


DIAGRAM OF STEAM CONNECTIONS IN SUB-BASEMENT, ST. PAUL PUBLIC LIBRARY, SHOWING SIZES OF PIPING FOR HEATERS.

for this system, together with their heaters, washers, etc., are located in the fan room in the sub-basement, while the exhaust fans (disc type) are placed in the exhaust fan rooms in the attic. In the installation provision is made for the control of the exhaust fans from the plenum fan room.

2. Toilet Ventilation. This system exhausts from the toilet rooms only, in addition to the janitor's closet. It is operated by a fan in the sub-basement fan room. Valved vent registers are placed both at the ceiling and floor of the toilet rooms, the air being exhausted at both points, as well as through locally vented fixtures.

3. Main Lobby Ventilation and Heating. The fan and heaters for this system are also located in the sub-basement fan room.

In laying out the ventilating system, considerable thought was given to the requirements in the way of air changes. As a result, a six-minute air change was provided for in the children's room, a ten-minute change in the general reading room and a fifteen-minute change in the rest of the building, with the exception of the stack rooms,

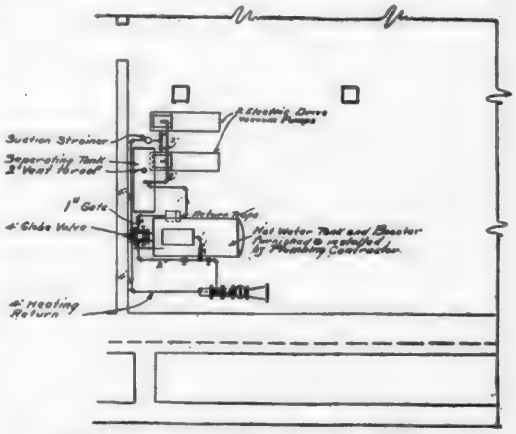


DIAGRAM OF STEAM, WATER, AND RETURN CONNECTIONS BETWEEN HEADER, HEATER, TRAP, VACUUM PUMPS AND SEPARATOR TANK.

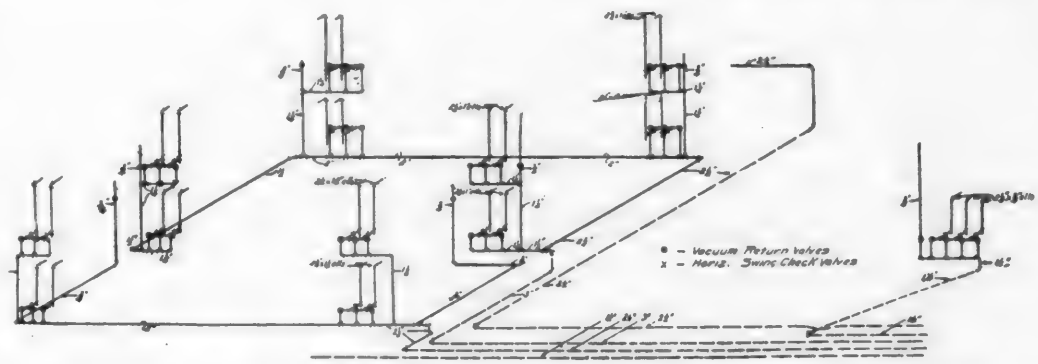
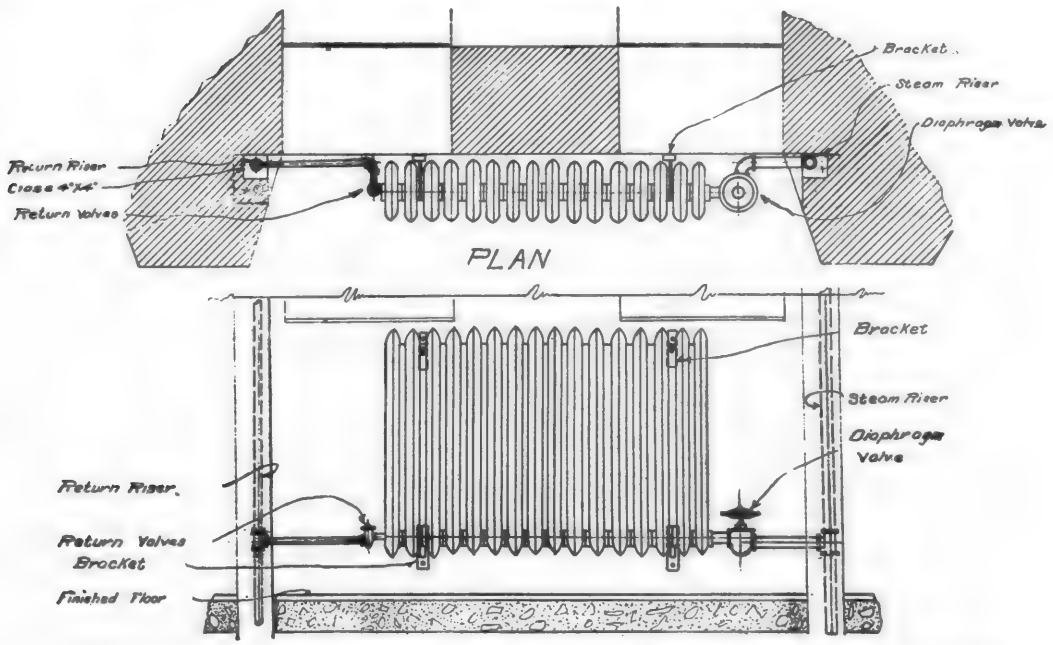
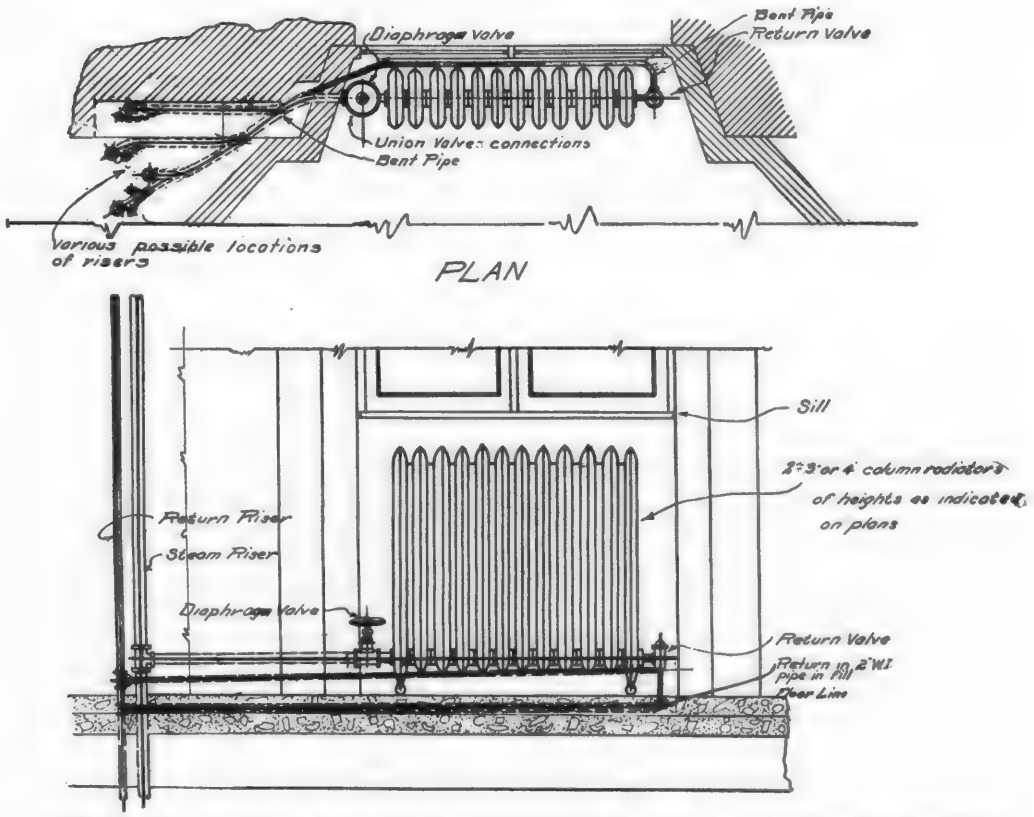


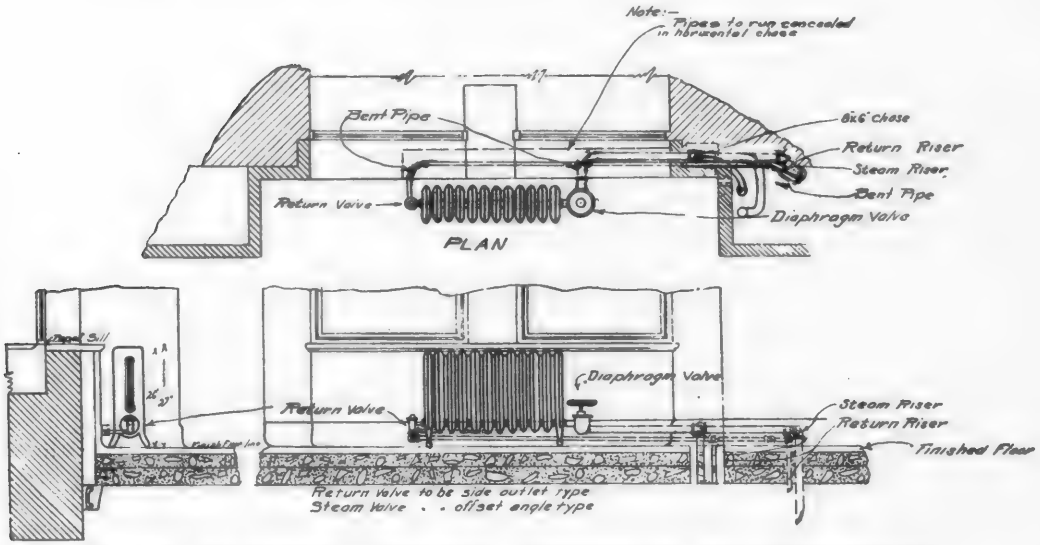
DIAGRAM OF RETURN CONNECTIONS, ST. PAUL PUBLIC LIBRARY, SHOWING SIZES OF PIPING FOR HEATERS.



DETAIL OF TYPICAL RADIATOR FOR STACK ROOMS, SHOWING PIPING AND METHOD OF SUPPORT.



DETAIL OF TYPICAL RADIATOR CONNECTIONS, FOR RADIATORS ON GROUND FLOOR, FIRST FLOOR AND SECOND FLOOR.

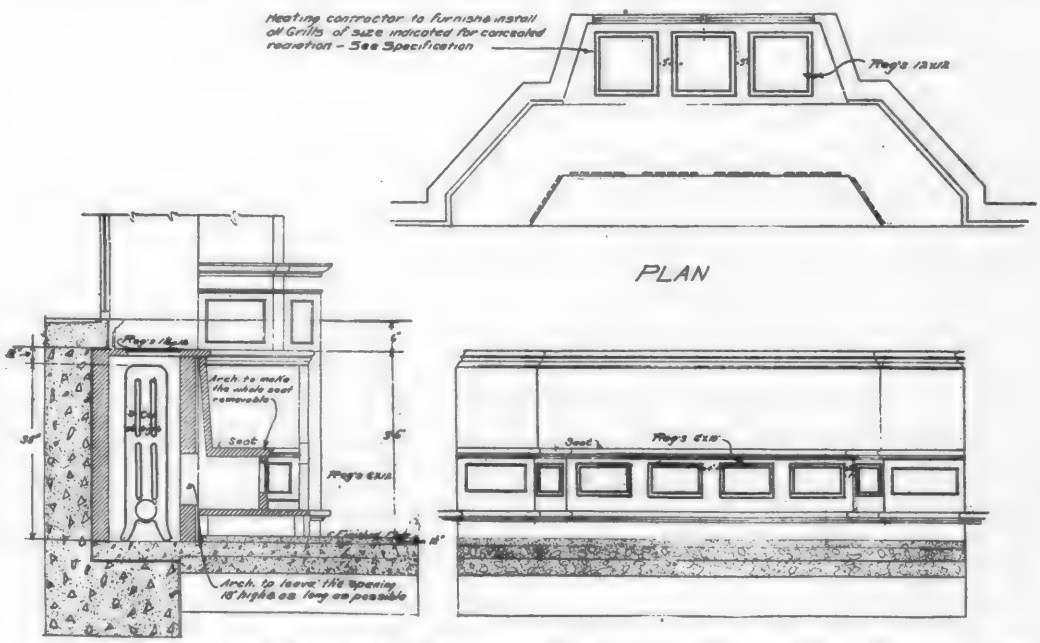


DETAIL OF TYPICAL RADIATOR CONNECTIONS FOR THIRD FLOOR.

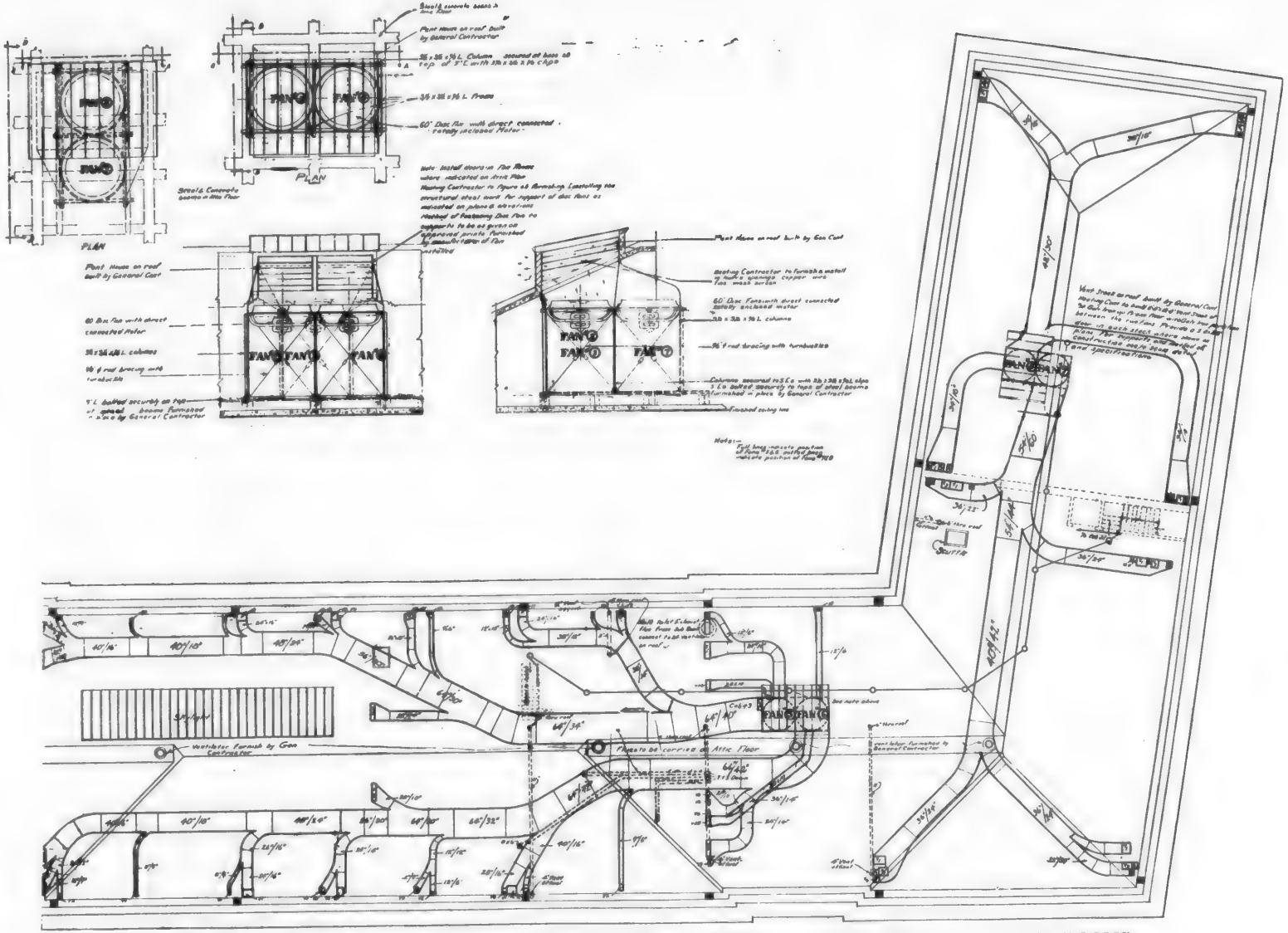
where a twenty-five-minute air change is provided. Considerable attention was also paid to the aesthetic features, the registers being made to conform as far as possible to the decorative characteristics of the room.

The air washers for the ventilating systems are entirely of copper and are equipped with a sensitive, automatic humidity controlling device. The heaters are all of the Vento type, single deck and double deck, with loops spaced on 5-inch centers.

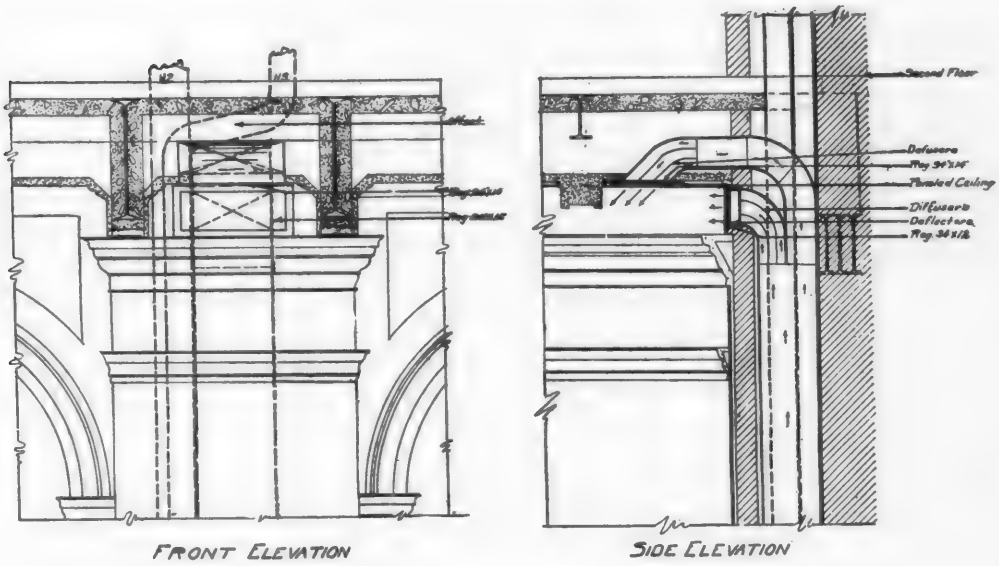
The architect of the St. Paul Library is Electus D. Litchfield, of New York, and the contract for the superstructure was let to a New York contractor for $430,000. The total mechanical equipment, embracing heating and ventilating, plumbing and sanitation, vacuum cleaning, electrical construction and elevators and dumb waiters, was de-

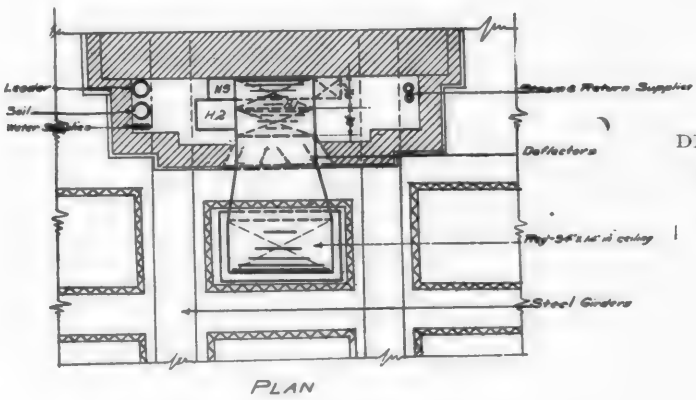

Heating contractor to furnish & install all Grills of size indicated for concealed radiation – See Specification
Reg's 13x18
PLAN
Reg's 18x18
Arch. to make the whole seat removable
Seat
Reg's 6x18
Arch. to leave this opening 18" high as long as possible
Seat
Reg's 6x18

DETAIL SHOWING SIZES AND POSITION OF REGISTER FACES FOR RADIATORS IN CHILDREN'S ROOM.


PLAN
Plant House on roof built by General Contr
60" Disc Fan with direct connected Motor
36 x 36 x 7/16 L. columns
3/4" ϕ rod bracing with turnbuckle
7" I. bolted securely on top of special beams furnished in place by General Contractor
FAN
PLAN
Steel & Concrete beams in Attic Floor
Plant House on roof built by Gen Cont
Heating Contractor to furnish & install 12 tube x openings copper wire fan mesh screen
60" Disc Fan with direct connected totally enclosed motor
36 x 36 x 7/16 L. columns
3/4" ϕ rod bracing with turnbuckle
Columns secured to I. Cs with 8" x 36" x 7/16 L clips & I. Cs bolted securely to tops of steel beams furnished in place by General Contractor
Hoist—
Attic Floor
Roof
Ventilator furnished by General Contractor
Scuttle
Ventilator furnished by Gen Contractor
Floors to be carried on Attic Floor
Ventilator furnished by General Contractor

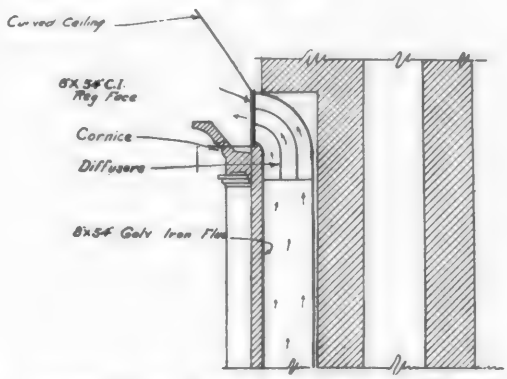
ATTIC AND ROOF FLOOR PLAN, ST. PAUL PUBLIC LIBRARY, WITH DETAIL OF FAN ROOMS.



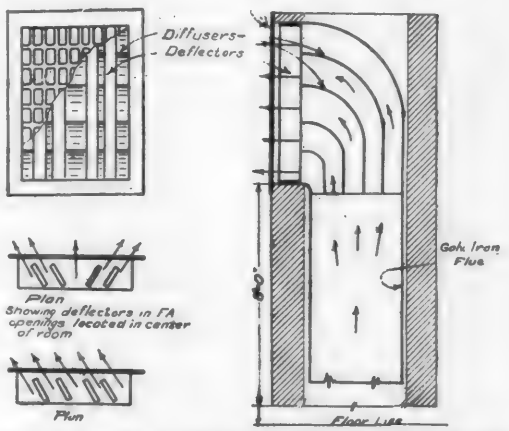


DETAIL, SHOWING SIZE AND POSITION OF FRESH AIR REGISTERS IN LIGHT READING ROOM.

signed by the Charles L. Pillsbury Co., engineers, Minneapolis and St. Paul. Separate contracts for this mechanical equipment totaled $81,898.



DETAIL OF FRESH AIR FLUES FOR LOBBY.



DETAIL OF REGISTER FACE AND FLUE SHOWING DIFFUSERS AND DEFLECTORS.

RIVERSIDE AND DAN RIVER COTTON MILLS, DANVILLE, VA.

The Cooling of an Industrial Building

RIVERSIDE AND DAN RIVER COTTON MILLS, DANVILLE, VA.

In addition to the very general public demand that all industrial buildings should be heated, the manufacturers and owners have demonstrated to them so forcibly the economy by procuring proper temperatures and conditions through the winter, that there is no longer any disposition on the part of any one not to provide sufficient heat in his factory building.

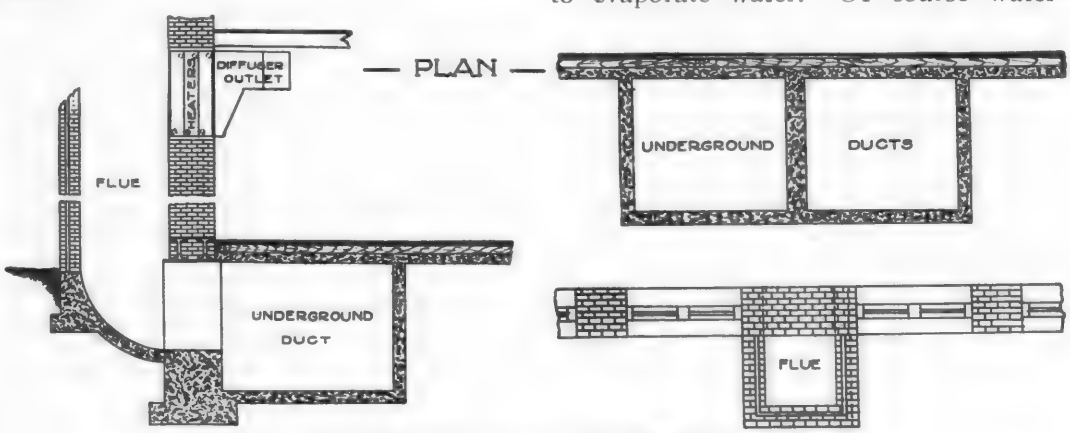
It is also well fixed in the minds of all that if buildings could be maintained cool and comfortable in summer, greater production could be procured in every industry. Cooling of mills and factory buildings by means of refrigeration, due to excessive cost, is far from being an economical proposition, but the cooling of buildings of any kind by evaporation is of the greatest interest, largely due to the fact that the cost, while greater than necessary for a heating system, is still not expensive. The cost of maintenance and operation are comparatively small.

COOLING BY EVAPORATION.

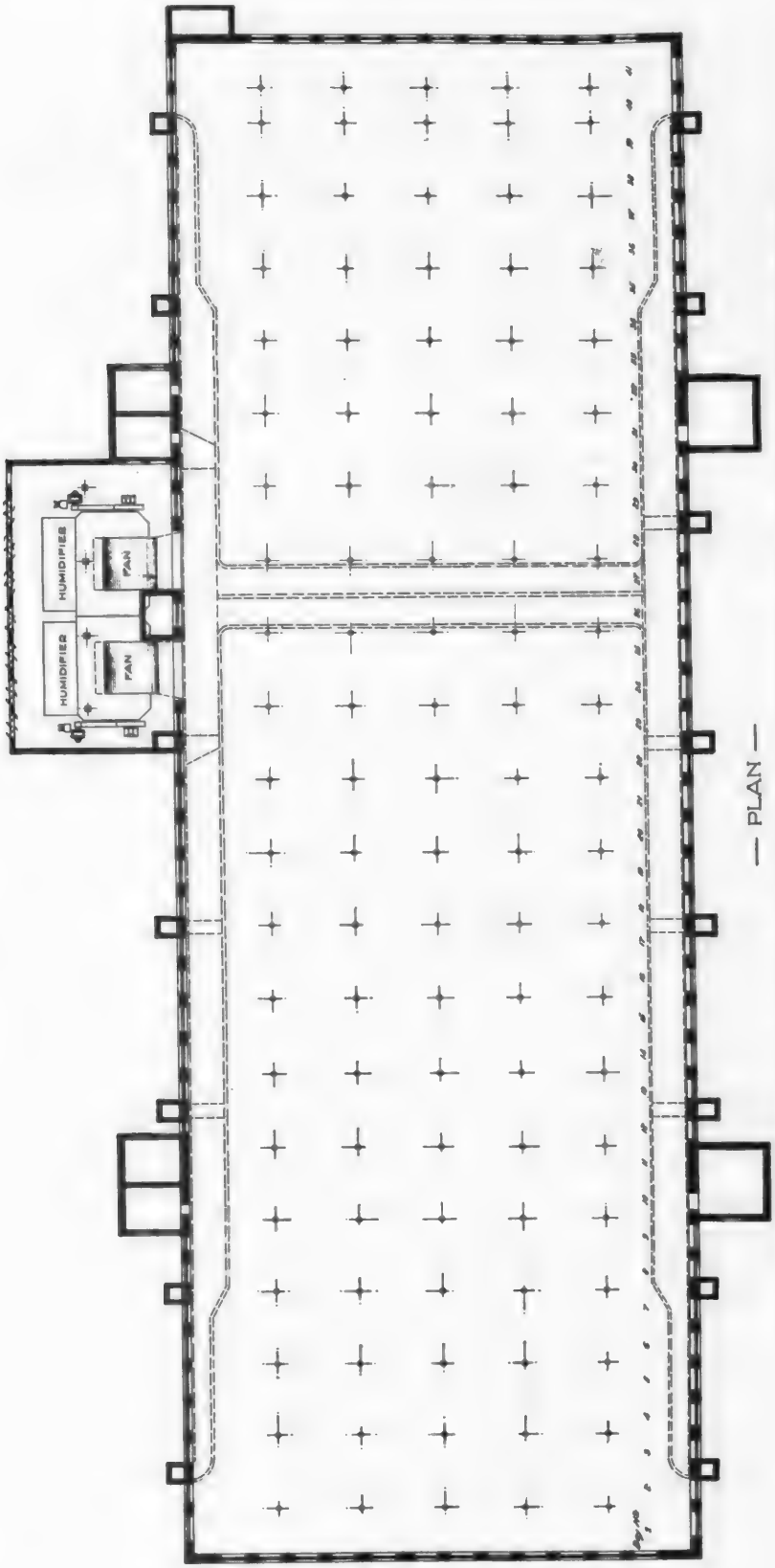
Cooling by evaporation is becoming extremely popular for nearly all classes of buildings, apparatus of this character having been installed in bank buildings of the Bankers Trust Company; the J. P. Morgan & Co., and Kuhn, Loeb & Co., in New York, in department stores such as the new buildings of the Lord & Taylor Company, Bonwit, Teller Company, in New York, and the Kauffman Bros., of Pittsburg; in hotels, among which are the McAlpin and the Astor, of New York; Wisconsin Hotel, of Milwaukee; the Fort Dearborn, of Chicago; in office buildings of Armour & Co., of Chicago; National Cash Register Company, of Dayton, Ohio, and in almost every kind of industrial building that could be named.

PRINCIPLE OF OPERATION.

The principle of operation of this apparatus is extremely simple, depending entirely upon the latent heat necessary to evaporate water. Of course water



PLAN AND ELEVATIONS OF DUCTS IN MILL NO. 4.



— PLAN —

FIG. 1—UNDERGROUND AIR DUCTS IN MILL NO. 4, RIVERSIDE AND DAN RIVER COTTON MILLS.

FIG. 2—AIR OUTLETS, WITH DIFFUSERS, IN MILL NO. 4.

will not evaporate unless it can procure from some source the required latent heat, or heat of evaporation, as it is sometimes called.

The apparatus used is built very similar to the air washers used now so extensively, but it differs in many very important details, which need not be treated here.

The air to be cooled is usually taken from out of doors, and is drawn through a humidifier, where it comes in contact with a large quantity of an exceedingly finely-divided spray, which completely saturates the air. As the water evaporates it cools the air an amount depending upon the humidity of the outside air, which on hot days provides a cooling effect of the air from 12° to 20° F.

Incidentally, in cooling the air it is

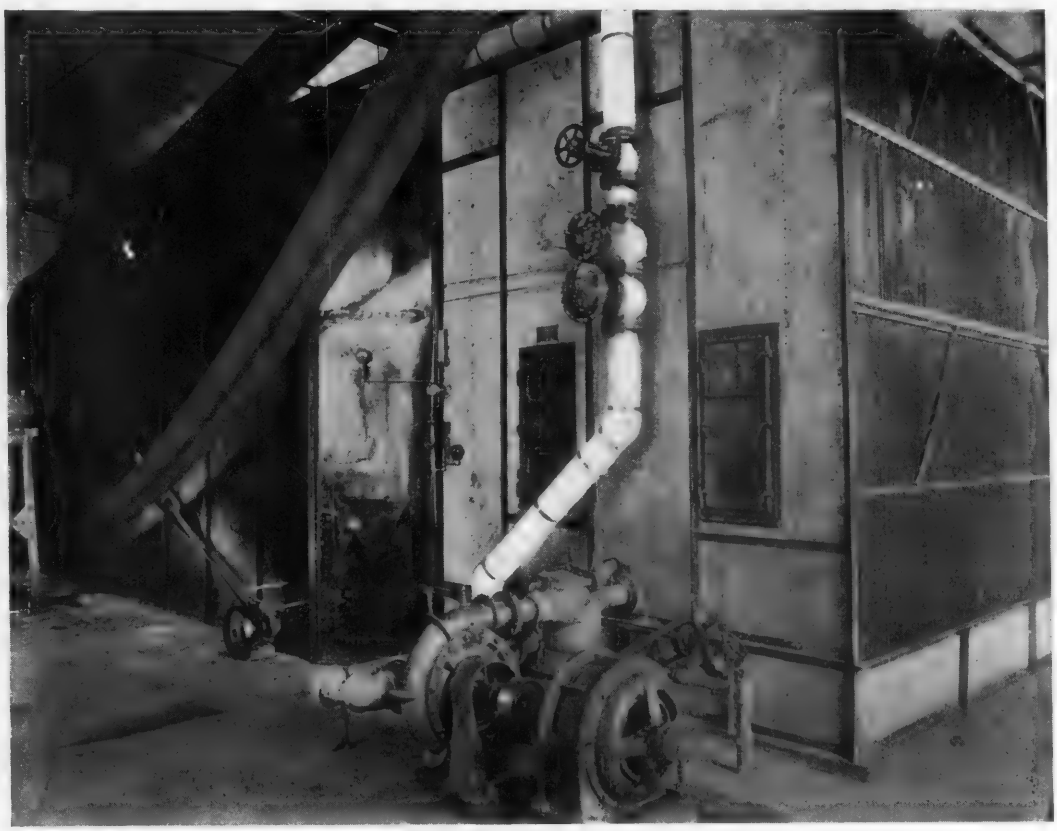


FIG. 3—ARRANGEMENT OF RELATIVE HUMIDITY AND TEMPERATURE CONTROL APPARATUS IN MILL NO. 4.

also washed and purified, after which it passes between baffle plates which entirely remove all particles of water, so the air emerges from humidifier cool and clean.

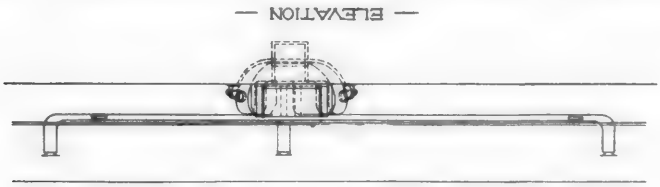
It is our pleasure to be able to present herewith plans and photographs of two installations made by the Carrier Air Conditioning Company, New York, at the Riverside & Dan River Cotton Mills, Danville, Va. The installation is particularly interesting, due to the fact that the size of equipment used is greatly in excess of that required for heating in winter, and the same apparatus provides for the heating, humidifying, cooling and ventilating of these mills, giving ventilation that is rarely, if ever, equalled in hospitals or school houses.

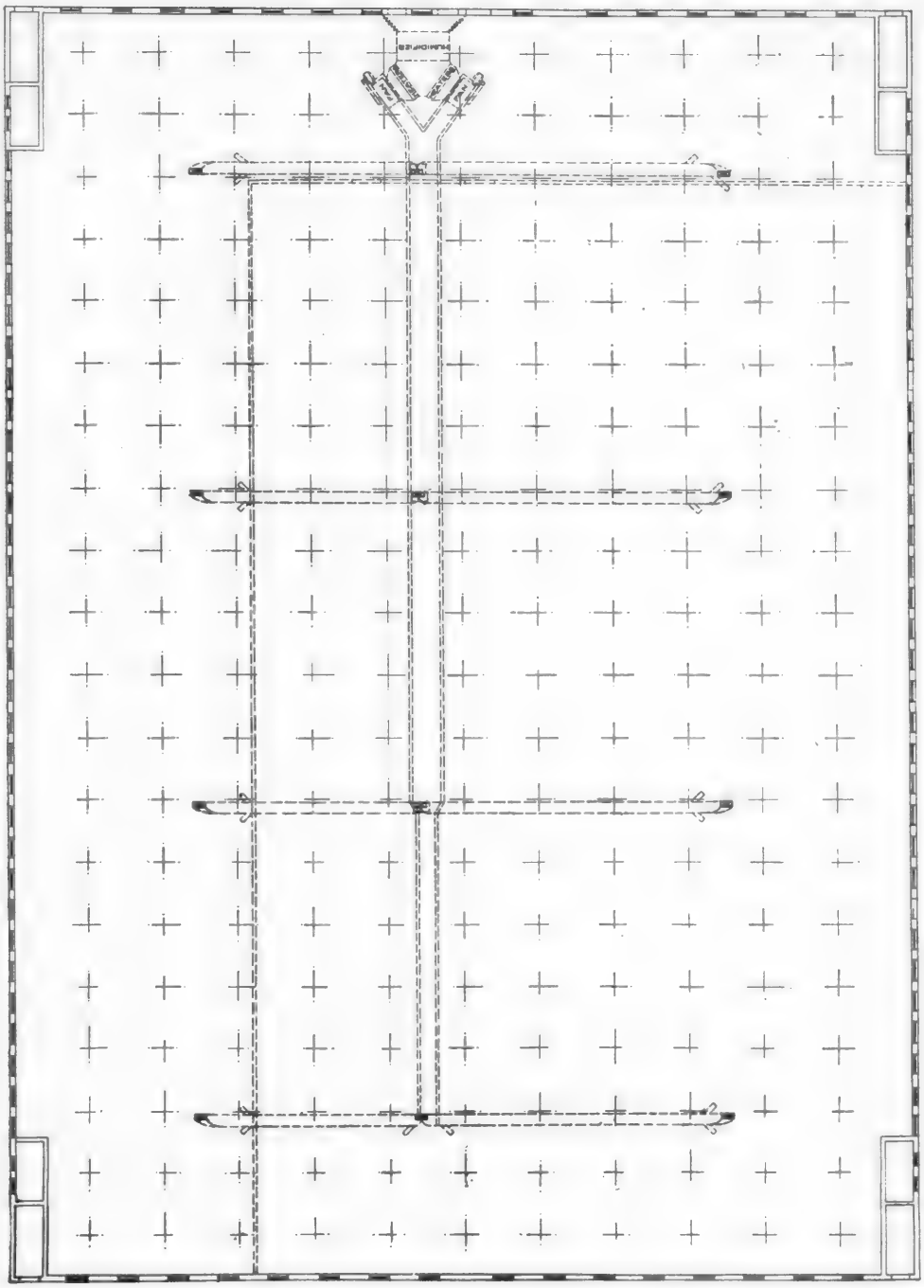
The main mill, No. 4, is four stories in height, and is 340 ft. long by 150 ft. wide. When fully equipped it will have 73,000 spindles, with the accompanying machinery. The weave shed, No. 4, is a one-story and basement building, 450 ft. long by 315 ft. wide. It will accommodate over 1,900 looms. All shafting and motors are hung from the ceiling of the basement, with belts extending through the floor.

Fig. 1 shows the arrangement of the No. 4 spinning mill. The air conditioning apparatus is placed in a single-story building adjoining the mill, and consists of two Carrier humidifiers, each of which is approximately 30 ft. wide by 13 ft. high. The air is drawn through the humidifiers by means of two No. 26 double inlet Buffalo fans. The amount of air handled in this building during the summer time amounts to approximately 500,000 cu. ft. per minute. The air is discharged from the fans through underground ducts, as shown by the drawings, and thence through pilasters alongside the building, and discharged into the various floors.

FIG. 4—VIEW OF HUMIDIFYING APPARATUS IN MILL NO. 4.

The heating coils, consisting of Vento radiation, are placed in each individual air outlet. These outlets are also provided with diffusers for distributing the air over the floors, as shown by Fig. 2. This arrangement allows the heating of any floor while cooling any other floor, and enables the one set of humidifiers to provide the various humidities best





— PLAN —

FIG. 5—UNDERGROUND AIR DUCTS IN BASEMENT OF WEAVE SHED, RIVERSIDE AND DAN RIVER COTTON MILLS, DANVILLE, VA.

FIG. 6—ARRANGEMENT OF AIR OUTLETS IN WEAVE SHED.

suited for the operation of the fibre in the various departments.

One of the greatest advantages of locating the heating coils in the outlets as shown is that these may be used for heating at nights to keep the building at a comfortable temperature simply by the induced current of air up the flues, and without operating the fans. It also enables the heating apparatus to take care of any local conditions and to guard against any portion of the building being cooler than any other portion, due to high winds or the like.

Textile mills are notorious for their high temperatures in summer. This excessive temperature is due to the friction of the immense number of high-speed spindles, shafts, etc., all of which produce heat. The writer has seen a temperature in a cotton mill of 111° F., when the outside temperature was 72° F., and with absolutely no heat supply to the room except the friction of the machinery.

In order, therefore, to absorb this heat, large quantities of air are required. One of the fans and humidifiers is ample for heating and ventilating during the cold winter months, while both fans are used throughout the hot weather of summer, when cooling is required.

The Carrier variable water temperature automatic humidity control is used for regulating the amount of moisture carried by the air leaving the humidifiers. In addition to this, the automatic relative humidity and temperature controls, as illustrated in Fig. 3, are used for regulating the steam supply to the heating coils and dampers in each outlet which regulate the quantity of air supplied to each room, thus providing for automatic humidity and temperature control throughout all seasons of the year.

The apparatus in the weave shed, while somewhat smaller, consists of the same equipment, excepting that in this case, with only one room having to be heated, the heating coils are placed between the humidifiers and the fans.

The distributing ducts are made of galvanized iron, carried along the basement ceiling with twelve vertical risers extending through the first floor and discharging the air about 10 ft. above the floor line. Each of these vertical flues takes up the same floor space as one loom, so that twelve looms out of 1,960 have been eliminated from the building, in order to provide for these air outlets. The air is distributed by means of diffusers of a conical shape.

Both mills can be kept at a lower temperature than outside during the hottest days of the year, instead of the frictional heat from the machinery keeping them very much higher than the outside temperature, as is usually the case with this type of mill.

Customers' Steam Heating Systems

A DESCRIPTION OF DIFFERENT TYPES FOR CENTRAL HEATING WORK.

Read at the sixth annual convention of the National District Heating Association, Rochester, N. Y., May 26-29, 1914.

BY H. R. WETHERELL.

The customer's heating system, if installed in the proper manner, is one of the greatest assets to the district heating company, and in nine out of ten companies this branch of the business receives little or no attention. However, a few of the heating companies are beginning to realize what it means to have the buildings which are connected to their mains piped in such a manner that the supply of steam can be controlled to suit the different changes of weather, without a waste of steam, and are now insisting on making the plans and specifications for all such systems.

Most managers of heating companies were told before their systems were established that 1 sq. ft. of radiation would condense between 500 and 600 lbs. of steam per heating season, and in most cases a flat rate system of charges were based on these figures. The managers then installed their plants and proceeded to sign up all of the business they could connect to their mains. The first buildings to be connected on these mains were the buildings which had their own steam plants, as it did not cost very much to change these plants over to use city service. The customers who wished to sign contracts and did not have the steam pipes installed, were told to go to the plumber and get him to install the system and connect to the company's service. The plumber would then notify the heating company as to the number of feet of radiation he had installed and the customer was billed with that amount.

After a couple of years the managers of these heating companies began to realize that they were not making any money on their service and that it was taking a great deal more steam than they had figured on. Some of the progressive managers who wanted to know the reason why, installed meters in some of the buildings and found that instead of condensing 500 lbs. of steam per square foot of radiation, they were condensing from 800 to 1,500, and as high as 2,000 lbs. of steam per square foot of radiation per season. The greatest cause for the high rate of condensation was that steam was sold by flat rate and therefore was being used 24 hours a day, from the time the season opened in the fall until it closed in the spring. If the customers got hot they opened the doors and windows in place of shutting off the service valve. It was also found that some of the buildings had insufficient radiation to heat the space required, therefore the radiation installed had a high rate of condensation. It was found upon investigation that it was almost impossible with the old one-pipe and two-pipe gravity systems of piping, which were used at that time, to keep the steam consumption down to 500 lbs. per season and give satisfactory service in all changes of weather.

DISADVANTAGES OF GRAVITY SYSTEMS.

As we all know, with the old one or two-pipe gravity systems it is necessary to have the radiator valve turned all on or all off, there is no half way. For example: we will take a small office with one 60 sq. ft. radiator installed, which is the amount of radiation required to heat the room to 70° F. temperature, with an outdoor temperature of 10° below zero. Now we will take a day when the outdoor temperature is between 35° and 40° above zero, with the radiator all on, it is too hot in the office; with the radiator off it is too cold, so the only salvation the customer has is to open the window down and turn the radiator on full. If the radiator is near the window, which it generally is, the temperature degrees difference between the steam in the radiator and the air around the outside of same is very high, therefore it is throwing out twice as many heat units per hour as are figured to heat the room with the window closed.

It has been proven by test that it is possible to condense twice as much steam

in a radiator placed in a room with the window open in a day that the outdoor temperature is 40° above zero, as the same radiator will condense on a zero day with the window closed. After having made these investigations, some of the larger heating companies are beginning to realize the importance of having the interior piping in the customers' buildings installed in the proper manner and, as stated before in this paper, are now making plans and specifications for this work. Several of these companies have looked into this subject very carefully and have tested out the various kinds of vacuum and vapor heating systems, of which there are about 100 or more patented systems on the market at the present time.

TYPES OF SYSTEMS USED.

The writer wishes to describe, in the next few paragraphs, a few systems which are in general use in buildings connected to district heating plants.

First, we will take the system which it was necessary for us to connect to our mains, when our district heating systems were first started. A number of years ago, before the district heating plant was in general use, it was the practice of the heating contractors to install either a one-pipe, two-pipe or an overhead gravity system. The main of the one-pipe system started at the supply opening of the boiler and a circuit was run around the basement and then connected back into the return opening in the boiler. Riser connections were made to this main and supply risers run to the upper floors and were connected to the bottom end of the radiator with an ordinary radiator valve.

It was necessary for the condensation from the radiator to drain back to the main through the same riser against the flow of steam coming into the riser. This system was improved upon by carrying the main to the attic and dropping the supply risers to the basement and connecting them into a return line which was in turn connected into the boiler. The steam and water flow was thus in the same direction throughout the entire system, with the exception of the connections from the risers to the radiators.

The two-pipe gravity system was also used at this time and had a few advantages over the one-pipe system in the way of better circulation.

The success of these three systems depended entirely on the manner in which they were installed, as to whether the pipe sizes were large enough and the number of water pockets in the mains. It was the practice in those days to fire the boiler after the job was complete and if it circulated on a 1 lb. pressure, well and good, if not they would put on 5 lbs. If it did the work on 5 lbs. they would carry 10, 15 or 25 lbs. until they struck a pressure that the job would circulate on.

HIGH PRESSURES FORMERLY NECESSARY.

When our district heating plants were started and these systems were connected to our mains, we soon found that it was necessary for us either to maintain 30 or 40 lbs. pressure in our street mains, which was next to impossible in a system supplied from a combined plant furnishing electric and steam service, or remodel the systems so they would circulate on 1 lb. pressure. If the customer would remodel his system by cutting out the water pockets, and by increasing the pipe sizes, and if he would install a trap and cooling coil at the end of his system, we were satisfied. We did not think at that time that it was possible for him to run three or four times as much as his flat rate.

TROUBLES WITH COOLING COILS.

We were told at that time, that if we installed a cooling coil equivalent to 20% of the radiation connected, the system would discharge the condensation into the sewer at a temperature of from 100 to 125° and that the customer would save from 12% to 15% in the cost of heating his building. This may be true if you can get the customer to install the required amount of cooling coil in the proper manner, and get him to leave it that way. His first objection is the cost of installing the coil together with the warm air and cold air ducts. Then when the first cold wave comes along, at night, after a rather mild day, and when the steam is shut off in the building, the coil freezes up and breaks. This causes an expensive repair job for the customer to pay and he gets disgusted with the coil

and takes out the cold air duct. He then gets his cold air supply from the basement and in nine cases out of ten this is bad air. The next time you inspect his building you find that he has covered the hot air register with a piece of linoleum. If you were to place a thermometer in the condensation leaving this coil, you would find the temperature from 200° to 210° F. Therefore the coil would be of no benefit to either the company or the customer.

It is very hard in the larger buildings, for example, a building which contains about 20,000 sq. ft. of radiation, to find a room large enough to utilize the heat from the cooling coil which would have to contain 4,000 sq. ft. of surface. It would be necessary in a building of this kind to divide the coil in smaller units. The customer would then object to the coil for two reasons. First, that the cost of installing the coil in this manner together with the hot and cold air ducts would be very high, and second, that they would not want to give up the space in the basement which the coils would require.

CONDENSATION SHOULD BE USED TO TEMPER COLD WATER SUPPLY TO HOT WATER TANKS.

It is a far better arrangement to utilize the condensation to temper the cold water supply to the hot water tank for domestic purposes. This arrangement will not only cool the condensation to a much lower temperature, but will also cut down the expense of heating the hot-water, which is rather expensive for the customer if it is not watched.

It will not be necessary to go into the disadvantages of the one and two-pipe gravity systems, as everybody who is interested in the district heating business has had complaints from same.

THE MOLINE SYSTEM.

We will now take up the Moline system of heating. The Moline system is a vapor system, which has been on the market for the past seven years. It was originally called the Shurtliff system. It is a two-pipe system, using hot water radiators with steam supplied to the top of the radiators through a restricted valve that is proportioned to give each radiator its proper supply of steam at a predetermined pressure. The return valves are lock shield angle valves with cages to keep dirt off of the seat. There is an ejector on the end of the steam main circuits to vent the mains quickly from air. This ejector discharges into a condenser radiator, which utilizes the discharge and prevents waste of steam. A heat valve of simple construction is set on the end of the condenser to give the radiators a free discharge to the atmosphere when they are cold and to prevent the escape of steam when they are hot.

The Moline system on central station work is designed differently from systems used on other work. The radiation is figured with a 20% to 25% excess to make each radiator carry its own percentage of economizing coil. A pressure reducing valve is set on the steam service to limit the pressure on the mains to ½ lb. or less. The condensation is removed from the piping through a seal that serves the purposes of a steam trap but has no floats or valves. Some of the advantages claimed for the Moline system for central station heating are:

Economy, due to ability to control heat delivery in accordance with the weather requirements. The control of heat delivery can be effected either by setting the individual radiator supply valves to heat more or less of each radiator, or by using a heat regulator controlled from a thermostat set in the premises to be warmed.

Elimination of odors from air escape from the radiators.

Absence of automatic valves or vents of any kind at the radiators.

Freedom from leaks or drips of any sort. The only opening being in the basement.

THE DUNHAM SYSTEM.

Next we will take the Dunham system.

The Dunham system is a two-pipe system with an ordinary radiator valve on the supply end of the radiator and an expansion trap on the return end of the radiator. There is a vacuum pump connected to the return mains which causes a suction on the return lines and pulls the water and air from the radiators.

The Dunham system is like all other two-pipe vacuum systems save for the

expansion trap which is made by the Dunham Company. From the trap come the names of the various vacuum systems that are on the market. This being the case, I will confine my explanation wholly to the steam trap.

The Dunham trap is simply an expansion trap with a metal diaphragm, which is mounted horizontally. This diaphragm is filled with a liquid that vaporizes when the steam comes in contact with the diaphragm, which expands and seats the valve. Then when the condensation from the radiator fills the trap and becomes cooled the vapor in the diaphragm condenses which allows the same to contract, the valve is opened and the water and air pass into the return pipe. This system can be operated in connection with the Johnson system of thermostatic control, by installing a Johnson diaphragm valve on the supply end of each radiator in place of the radiator valve.

The Dunham system is not used very extensively in buildings connected to a district heating system, except in some of the large buildings in the larger cities, as a vacuum pump is not desirable in district heating work. Therefore they do not claim many advantages. However, I wish to describe an installation of the Dunham system, which has been called to my attention.

INSTALLATION IN THE MARQUARD APARTMENTS, NEW YORK.

The system in question, was installed by the Thompson Starrett Company, of New York City, in the Marquard Apartments, also of that city.

The method of heating is by direct radiation throughout, the total amount being 11,000 sq. ft. and the number of radiators 405. About half of these radiators are concealed in wood enclosures lined with sheet metal and asbestos and provided with grills in front and top. Hot water radiation was used throughout and all inclosed radiators have the steam connection at the top, the valves being provided with special extended stems so as to be operated from outside enclosures. The return end of all radiators are provided with Dunham expansion traps.

Steam is taken from the street mains at about 60 lbs. pressure and is reduced inside of the building to 15 lbs. It is then reduced through a second reducing valve to a pressure varying from zero to 1 lb., depending on the weather conditions. Steam circulates through the entire system at 1 lb. pressure.

The system is what is known as the "up-feed," with mains in the basement, reducing from 8-in. at the start to 2½-in. at the extreme ends. All of the radiators, risers and offsets in mains are dripped with Dunham traps into the return line which runs in the basement along side of the supply main. The return line is connected to a Berryman feed water heater of the horizontal type. This heater is used as a cooling coil, the temperature of condensation being reduced by means of the cold water passing through the tubes, which cold water is slightly warmed before entering the hot water heater for domestic purposes. The condensation, after passing through the feed water heater, is discharged into the sewer. There is an 1¼-in. vent line taken out of the top of the return line where it drops down to connect into the feed water heater. This vent line is for the purpose of relieving the system of air.

The following are the advantages claimed of the Dunham system:

Elimination of the automatic air vent on the radiator, which does away with the leakage of foul air and water discharge from the same.

Quicker and better circulation than obtained with the gravity system.

Absence of water hammer in radiators.

THE AUTOMATIC VACUUM SYSTEM.

We will next take the Illinois Engineering Company's "Automatic vacuum system."

This, like the Dunham system, is a two-pipe vacuum system, the only difference being in the expansion trap on the return end of the radiator. This company, however, recommends the use of hot water radiation and connecting the steam supply to the radiator at the top of same, using a modulating valve in place of an ordinary radiator valve. By this arangement they can control the supply of steam to each radiator.

The Illinois Engineering Company's radiator trap, which is called the Thermo automatic vacuum valve, is also an ex-

pansion trap. The diaphragm is made of phosphor bronze copper plated, and is mounted vertically. When the steam in the radiator comes in contact with the diaphragm it expands and shuts the valve against the steam leaving the diaphragm on the oposite side of the valve seat from the radiator. This is one of the advantages claimed for the trap. With the diaphragm in the return pipe it will cool more quickly than it would if it were in the base of the radiator and, therefore, it makes the trap more sensitive, which avoids the accumulation of water in the base of the radiator.

Other advantages claimed for this system are as follows:

The use of the graduated supply valve on the radiators enables the customer to control the amount of steam supplied to the individual radiator and thereby control the temperature in the room. It also discourages the customer to leave the windows open and controlling the temperature by this means.

The use of the thermostatic return valve in connection with this system, prevents blowing of steam through the radiators into the return mains, at times when it is necessary to carry several pounds pressure on the system.

As the valve seat of this trap is in a vertical plane, the dirt and scale, from the piping and radiators washes off the valve seat so that the valve always closes tight.

Like all other two-pipe vacuum systems, there is less chance for water hammer and it has a much quicker and better circulation than the gravity system.

WEBSTER SYSTEM.

The Webster System of heating, which is a two-pipe vacuum system similar to the Dunham system, is very popular in the larger cities.

ATMOSPHERIC SYSTEM.

We now come to the Atmospheric system of heating, which we might say was designed particularly for district heating use.

The principles, which are embodied in this system, were in use some thirty years ago, but within the last few years have been taken up by the American District Steam Company, which is now manufacturing the specialties used in this system.

The Atmospheric system is noted for its simplicity of design and economy in operation and installation. It is a two-pipe system, with mains starting at the reducing valve, which is located near the service valve. A reducing valve that will reduce the pressure from the various pressures carried on the street mains to atmospheric pressure on the low side of the valve is required. Supply mains are installed of the proper size to carry the radiation connected with practically no drop in pressure from the service valve to the extreme point on the system. The return mains are installed of the proper size to carry the air and water to the receiving tank by gravity. Mains and returns have a continuous fall from the reducing valve to the receiving tank.

The receiver is a piece of pipe about 5 ft. long, with a cap on each end. There are three openings in the top of the tank. From the center opening is taken an open vent pipe, which is carried to the nearest chimney flue and extended vertically about 25 ft. Into the other two openings in the top of the receiver the return mains terminate. The bottom of the receiver is equipped with two openings for drip line connections, and in the side of the receiver near the bottom, is an opening for the meter connection. From this opening, the outlet pipe is carried vertically to within about 6 or 8 in. of the top of the receiver, then horizontally to the meter location, and then down to the meter. A tee is placed in this line where it drops down to the meter. From the top opening of this tee, an open vent pipe is extended up a reasonable distance to prevent the formation of a syphon.

The radiation used is the hot water type, cast-iron, tapped ¾-in. top and bottom at opposite ends. All radiators are fed at the top through an Adsco graduated radiator valve, and the return is connected to the radiator with a union ell at the bottom at the opposite end. No automatic air valves are used as the air passes through the return pipe with the condensation.

There is a mercury gauge placed in the main near the reducing valve. This gauge registers the pressure carried on the system in ounces.

The simple principle involved in the

operation of an Atmospheric system is that of steam under a few ounces pressure displacing air at atmospheric pressure. The entire system having an open vent to the atmosphere, is at all times subject to a free inlet or outlet of air. Steam entering the radiator at the top displaces the air within, through the outlet, opening at the bottom thence by the return piping which acts also in the capacity of an air line to the outer atmosphere.

The Adsco radiator valves are made with various sizes of openings in proportion to the size of radiators they are to be used on. Therefore, the supply of steam to the radiator can be controlled to heat any part of the radiator that the weather conditions may demand, but never more than 85% of the radiator with a full opening of the valve and with a maximum outside temperature of zero F. This factor of safety is allowed to prevent the escape of steam into the return.

The amount of radiation specified for Atmospheric systems should be about 25% in excess of that required on a straight steam basis.

The main advantage claimed for the Atmospheric system is economy. Economy for the customer, if he has a meter rate contract, or economy for the company, if he has a flat rate. For the customer, economy is effected as it is possible for his tenants to control the temperature in their rooms, without opening the windows in mild weather and it thereby stops the waste of steam. For the heating company, it stops a great deal of the waste of steam by the flat rate customer. With the waste of steam eliminated, the central station can take care of a greater amount of business with a less pressure in the underground mains. No cooling coil is required with the Atmospheric system, as 15% of each radiator is devoted to that purpose, and the condensation is discharged into the sewer at about 80° to 100° F.

The automatic air vent is eliminated with this system, there is no chance for water hammer and the circulation is very rapid.

A very good arrangement for buildings larger than 16 stories or buildings which have indirect radiation installed, and where it is necessary to carry more than 1 lb. pressure at certain times of the year, is to install a system in the same manner as the Atmospheric system, with an Adsco radiator valve on the supply end of the radiator, and a reliable expansion trap on the return end of the radiator. This will give you a system which can be operated on a few ounces pressure in the milder weather and one which if necessary, in extreme cold weather, a pressure of several pounds can be put on the system, without effecting the circulation of the same.

New Formula for Rating House Heating Boilers

In addition to formulating a plan for the testing of house heating boilers, a committee on this subject which presented its report at the recent meeting of the heating engineers' society (published in THE HEATING AND VENTILATING MAGAZINE for February, 1914), also suggested a method for determining boiler ratings. This formula is intended to include the elements or factors which go to make up the commercial rating and is as follows:

While it is not within the definite instructions of this committee to suggest a method for determining ratings, yet it would seem only logical that there should be suggested a formula which shall include the elements or factors which go to make up the commercial rating, and we therefore suggest the acceptance of the following equation:

First, where the boiler is to be used for house-heating work and is expected to maintain its capacity for a number of hours without attention—

$$\frac{C \times 0.8 \times E}{T \times 0.25} = R$$

Wherein C expresses the fuel carrying capacity of the boiler; E, the average evaporation per pound of coal based on those tests in which the duration rates fall between 6 and 10 hrs.; T, the time boiler is expected to operate without attention; R, the rating in square feet of direct radiation or its equivalent (load on boiler); 0.8, the portion of the fuel which shall be considered as available for the time T; in other words, it shall be considered that 20% of the full fuel holding capacity will be a reserve on a rekindling charge unless otherwise stated by manufacturers. The term 0.25 shown in the denominator, shall be considered as the amount of steam condensed per square foot of steam radiation per hour when standing in air at 70° F. and with a temperature equivalent to 2 lbs. gauge pressure at the boiler (sea level).

Where boilers are installed under the care of a fireman and under constant attendance, C in the foregoing formula may be considered as the amount of coal burned per hour—the 0.8 factor and factor T may be omitted, making the formula read—

$$\frac{C \times E}{0.25} = R$$

C in this case represents, as stated in the foregoing, coal per hour.

DISCUSSION.

PROF. KENT: When the committee prepares its report for final publication I wish it would explain the clause where C expresses the fuel carrying capacity of the boiler. As T is the denominator and C the enumerator, it would indicate that C divided by T is the fuel burned per hour. This is not clearly stated. As to the phrase "including the last charge of wood," I think the word "last" should be left out, because it means all of the charge of wood, as I understand it.

A MEMBER: I cannot reconcile the fact that these tests are to be run under a fixed condition of draft and also at a certain rate of combustion. It seems to me that one of these conditions is entirely dependent upon the other. While the measures of draft are very interesting as matters of record, what you are really after is to establish the rate of combustion and you can get just as accurate and dependable results without mentioning the draft at all.

MR. W. M. MACKAY: Under usual conditions, where house heating boilers are run for a length of time without attention—say eight hours, I have found that the best results are obtained by using free burning coal, such as Lackawanna. In this report Lehigh Valley coal is mentioned, which is a harder coal and would be more effective under conditions of draft which might be obtained in a laboratory and not in the average house heating apparatus. My opinion is that we would not get reliable results by making a short test with a strong draft using such a hard coal. In power boilers, as shown in this report, with firemen and stronger draft, good results can be obtained with the coal specified.

MR. NEWPORT: In addition to an

"approximate analysis of the coal" which the committee recommends should be made to determine its various constituents, I believe that an analysis should be made of the unburned fuel, because that varies considerably from the fuel as fired.

P. H. SEWARD: I did not have an opportunity to see or read this report before coming to the meeting but I can see no objections and it looks to me like a very good report.

Of course, in considering a matter of this kind, it is necessary to determine the angle from which you are going to approach the subject. The demand for house heating boilers is possibly not always accompanied by a desire for true operating efficiency, because if such was the case, the boiler manufacturers might be building radically different boilers than they are to-day. I am of the opinion that the demand is almost entirely along commercial lines and, in a great many cases, the desire for high capacity in the individual boiler is much more insistent than the demand for operating efficiency. This is an entirely commercial and natural desire and, in consequence, manufacturers of boilers build them high in capacity and, if possible, low in cost of production. They could build boilers high in efficiency and more expensive in construction if the demand ran that way. It is a fact, however, whether fortunate or unfortunate, I do not know which, that house heating boilers are frequently sold by their capacity and without much regard to their efficiency. Therefore, it is very natural that a boiler manufacturer should have at least one boiler on his list that is high in capacity without regard to efficiency, low in cost of production, and apparently low in price at which it will sell, based on capacity only.

A great many steam fitters, I won't say heating engineers, just steam fitters, seem to prefer that kind of boiler and as long as such is the case, there will always be manufacturers of boilers to supply their wants.

I think this test code is the result of a desire upon the part of the steam fitter for some method of harmonizing the relations between boilers of different makes and design, so far as their rated capacities and prices are concerned. Furthermore, I think that is the only reason existing for a test code of this kind, or probably for anything on the subject of boiler ratings.

If engineers really desire anything at all, it is a uniform method for rating boilers and it is a good thing to keep in mind the difference between a method for rating and the rating itself. A few steam fitters are interested in boiler tests, but they would also like to have a uniform method for rating whereby they could determine the relative capacity of various competitive boilers. The method of rating the boiler will, of course, also determine its relative efficiency and, if the method is uniform, the comparative results will be established.

There is nothing, however, in the proposed test code to accomplish anything of this kind. It simply outlines a method of testing boilers which is very good, entirely practicable, very simple and will give all the results desired, providing you keep in mind that the information really needed about a house heating boiler at this time is not its efficiency so much as its relative capacity.

We desire knowledge as to how many feet of radiation a particular boiler is capable of supplying under certain defined conditions. This test code would give you all that information if conditions were definite, but there is a joker in it because when you get through with your test, you will be unable to determine the relative capacity of two different boilers without first making the factor "T" uniform. That is the "nigger in the woodpile." Unless factor "T" is made uniform, we can accomplish nothing and will know no more about the subject of uniformity in methods for boiler ratings than we did four or five years ago and will be no nearer its solution than we were then.

Without making factor "T" uniform, the only point we will determine is the capacity of an individual boiler under certain conditions. The capacity of the fire pot in house heating boilers for holding coal has a great deal to do with its capacity for supplying radiation and it will be found that the boiler that holds a large amount of coal, is rather free in its flue construction, and permits a rapid

rate of combustion, will show a relatively high capacity when expressed in a limited number of hours during which the coal is to be burned. This is the whole thing in a nutshell.

Unless an effort is made to have factor "T" uniform and standard under certain well-defined conditions, I do not see how this society or any other party, can accomplish very much.

I used to think at one time that there was a very keen desire on the part of our society and others to arrive at some solution of this problem. I am inclined to think now there is no such desire. We are pretty well satisfied with things as they are and I believe that most of us think we are clever enough to get away with it.

This boiler rating problem is a very mysterious thing. It enables a good many steam fitters who know a little more than their competitors to take advantages. Therefore, I very much question if there is a large desire on the part of the trade as a whole, for any uniform method of rating boilers. The subject is too commercial. Boilers can be built to suit almost any conditions as to firing periods and price.

I think this report, so far as it goes, is a most excellent one. It covers every point at issue with the exception of that little joker "T," and it is doubtful if that was a question which the committee was expected to contend with. Therefore, they were justified in handling it the way they did.

Personally, I think the report should go upon our records as it represents a very distinct and definite advance along the lines we have been working, and while it accomplishes nothing so far as the desires of our members and the heating trade are concerned, it nevertheless helps to establish one fact, which is that house heating boilers are made and sold more by capacity than by efficiency. So long as this condition exists, the question is bound to be commercial rather than engineering.

Heating and Ventilation Laws and Regulations in the United States

REQUIREMENTS OF RECENTLY-ENACTED AND OTHER LAWS NOW ON THE STATUTE BOOKS IN THE VARIOUS STATES.

IV

Ohio (Concluded), Kansas, Maine

REQUIREMENTS OF THE DEPARTMENT OF INSPECTION OF THE INDUSTRIAL COMMISSION OF OHIO FOR THE HEATING AND VENTILATION OF PUBLIC BUILDINGS, HOSPITALS, ASYLUMS AND HOMES.

Under "Registers" are the following provisions:

(h) *Warm Air Registers in School Rooms —Location of.*—The lower edge of the warm air registers in school rooms shall be located not less than 8 ft. above the floor line, except where the height of story is insufficient; in these cases the registers shall be placed close to the ceiling.

(i) *Vent Registers in School Rooms—Location of.*—Vent registers in school rooms shall be placed with the lower edge of opening not more than 2 ins. above the floor.

Where hot air furnaces are installed, detailed provisions covering such installation are contained in Section 196-13 to 196-16. Additional sections provide for the proper construction and arrangement of hearths, laundry stoves, drying rooms, gas ranges, ranges for hotels, etc.; bake ovens, core and annealing ovens.

Section 196-24 provides for the protection of wood around heating apparatus. Wherever any heating apparatus in which fires are maintained are located in cellars, the top of such heating apparatus shall not be less than 18 ins. from any wood work.

The construction of standard fireproof heater rooms is contained in Section 196-25.

The code also regulates the construction of chimneys. Regarding their height the provisions are:

(a) *Minimum Height.* — The height of all chimneys (except for dwellings) having an internal cross-sectional area of more than 144 sq. ins., shall not be less than 55 ft. above the grade of the nearest street; provided, however, that such chimneys shall project at least 5 ft. above the roof of the building of which it is a part if the roof is flat, or 3 ft. above the

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ridge of any pitched roof of the building of which the chimney is a part.

(b) *Required Height Above Surrounding Buildings.*—The height of all chimneys having an internal cross-sectional area of more than 144 sq. ins. shall be at least 5 ft. higher than the highest point of any building within 50 ft. of such chimney.

(c) *Required Height Above Viaducts.*—The top of all smoke flues, chimneys or stacks within 100 ft. of any viaduct or bridge shall be at least 25 ft. above the roadway of the same.

The penalty for violations of the code is a fine to be not less than $25 nor more than $500.

Kansas.

Laws are now in effect in Kansas relating to the ventilation of factories and to the heating and ventilation of theatres: The factory ventilation requirements are contained in the Workmen's Compensation Law and are as follows:

Sec. 5. The commissioner, as state factory inspector (or deputy state factory inspector), shall have power to enter any factory or mill, workshop, private works or state institution which have shops or factories, when the same are open or in operation, for the purpose of gathering facts and statistics such as are contemplated by this act, and to examine into the methods of protection from danger to employees and the sanitary conditions in and around such buildings and places; and to make a record thereof of such inspection. If the commissioner as state factory inspector (or deputy state factory inspector) shall find upon such inspection that *the heating, lighting, ventilation or sanitary* arrangement of any workshops or factories is such as to be injurious to the health of the persons employed or residing therein, * * * he shall notify, in writing, the owner, proprietor or agent of such workshops or factories to make, within thirty days, the alterations or additions by him deemed necessary for the safety and protection of the employees; and if such alterations or additions are not made within thirty days from the date of such written notice, or within such time as said alterations or additions can be made with proper diligence upon the part of such proprietors, owners or agents, said proprietors, owners or agents so notified shall be deemed guilty of a misdemeanor, and upon complaint of the commissioner as state factory inspector before a court of competent jurisdiction, and upon conviction thereof, shall be fined in a sum not less than $25 nor more than $200, or by imprisonment not more than ninety days, or by both such fine and imprisonment.

Sec. 6. The following expressions used in this act shall have the following meanings:

The expression "person" means an individual corporation, partnership, company or association.

The expression "children" means minor persons under the age of fourteen years.

The expression "minor" means a male person under the age of twenty-one, or a female person under the age of eighteen years.

The expression "women" means female persons of eighteen years of age and upward.

The expression "factory" means any premises where steam, water or other mechanical power is used in aid of any manufacturing process there carried on.

The expression "workshop" means any premises, room, or place, not being a factory as above defined, wherein any manual labor is exercised by way of trade, or for the purpose of gain in or incidental to any process of making, altering, repairing, ornamenting, finishing or adapting for sale any article or part of an article, and to which or over which premises, room or place the employer of the person or persons working therein has the right of access or control; provided, however, that the exercise of manual labor in a private house, or a private room by the family dwelling therein, or by any of them, or in case a majority of persons therein employed are members of such family, shall not of itself constitute such house or room a workshop within this definition.

The aforesaid expressions shall have the meanings above defined for them respectively in all laws of this state relating to the employment of labor, unless a different meaning is plainly required by the context.

The fire-escape and theatre inspection law (Chapter 197, Law of 1911) contains the following provisions for the ventilation of theatres:

VENTILATION OF THEATRES AND PICTURE SHOWS.

Sec. 4. It shall be unlawful for the owner, proprietor or lessee to operate any theatre, picture show or place of amusement in any structure, room or place in the state of Kansas which structure, room or place is capable of containing fifty or more persons unless the system of ventilation is capable of supplying at least thirty cubic feet of fresh air per minute for each person therein.

Ventilator Fans—Booths for Picture Machines —Electric Wiring.

Sec. 5. All such structures, rooms or places used for the purpose mentioned in section 4 of this act having less than 500 cu. ft. of air space for each person, and all rooms having less than 2000 cu. ft. of air space for each person in which the outside window and door area used for ventilation is less than one-eighth of the floor area, shall be provided with a draught fan or other artificial means of ven-

tilation installed so as to force the stagnant air outward from said structure, room or place. In the end of the room opposite said fan an inlet ventilator shall be provided of sufficient size to admit the required amount of fresh air as provided in section 4 of this act. All booths used for moving picture machines shall be made of galvanized sheet iron of not less than 20 B. W. gage, or ¼-in. hard asbestos board, securely riveted or bolted to angle-iron frame (of not less than 1x1x¼ inch angle iron, property braced), or equivalent fire resisting material. A not less than 6-in. diameter ventilating pipe shall be used as an exhaust for the hot air generated in operating the machine. All electric wiring shall be in accordance with the National Electrical Code.

Failure to comply with the provisions of the act constitute a misdemeanor and a penalty is provided of $10.00 per day for such failure.

RULES, REGULATIONS AND SUGGESTIONS.

In order to assist the fire chiefs and fire marshals to secure a full compliance with the requirements of the law, the following rules and suggestions on the subject of ventilation are made by the Department of Building and Factory Inspection of Kansas:

Ventilation of Theatres and Picture Shows: In order to aid fire chiefs, fire marshals and others in determining the amount of ventilating space, or number and size of fans necessary to meet the requirement of Sections 4 and 5, Chapter 197, Laws of 1911, the following rules are suggested:

A. The natural ventilation by doors and windows. Under normal conditions and at normal temperature, the velocity of air travel is estimated to be from 30 to 60 ft. per minute where the exhaust equals the intake area.

B. The natural ventilation by ventilating flues or chimneys. Under normal conditions the velocity of air travel is estimated to be from 200 to 300 ft. per minute. The velocity of air travel through ventilators in ceilings will range about 100 to 150 ft. per minute.

C. *Small power fans* placed in windows or openings in walls give a forced velocity of air travel of from 800 to 900 ft. per minute where fans compare reasonably well with the size of the opening.

D. *The velocity* in number of feet of air travel per minute, multiplied by the number of square feet of area of the openings used for ventilation, will give the *volume of air in cubic feet* that will pass through the opening per minute.

E. *Te determine the required amount of artificial ventilation.* Multiply the number of seating capacity by 30, and from this amount subtract the number of cubic feet of air obtained per minute from natural ventilation, as per Rules 1 and 2. The remainder will be the amount of air in cubic feet to be supplied by fans or otherwise.

F. Where windows, doors or other natural means of ventilation are relied upon to furnish the required amount of fresh air, the fire marshal should see that they are kept open for that purpose, and all windows and other openings used as "intake" should be provided with proper shields or "baffle-boards" to prevent direct drafts on occupants of room.

All modern authorities on ventilation agree that the inlet openings should be near the top of room, or at least 8 ft. above the floor, and the outlet openings should be at or near the floor level, and in the opposite end of the room from inlet openings. Where seats are at different levels, outlet vents should be divided and placed at similar levels. Where fans are used they should always be placed at outlet, to draw the foul air out of the room. Short-circuiting of air currents should be guarded against.

Maine.

The only provision in Maine relating specifically to ventilation is contained in the "Abstract of the Health Laws of the State of Maine." This provision relates to school buildings and approval of plans and is Chapter 88 of the Laws of 1909. Section 2 of this act reads:

"Section 2. Where the plans and specifications prepared by the State superintendent are not used (the State superintendent prepares such plans and specifications for not to exceed four-room school buildings) all school superintending school committees of towns in which new school houses are to be erected, shall make suitable provision for the heating, lighting and ventilating and hygienic conditions of such buildings, and all plans and specifications for any such proposed school building shall be submitted to and approved by the State superintendent of schools and the State board of health before the same shall be accepted by the superintending school committee of the town in which it is proposed to erect such building."

In connection with this law, the State superintendent of public schools writes, under date of February 16, 1914:

This department, with the State Board of Health, has not compiled requirements for approved school buildings in printed form. Briefly, however, the following minimum requirements in relation to heating and ventilation are made:

The dimensions of school rooms must be sufficient to provide 240 cu. ft. of air space per pupil. Plans for ventilating must show provisions for at least 2,000 cu. ft. of air for each pupil. Fresh air inlets and foul air

outlets must be large enough to provide in cross section measurement from 16 to 20 sq. in. per pupil.

"Direct radiation from stoves or steam coils is discouraged. For small, single-room school buildings, jacketed stoves are in nearly all cases required.

"I may add that our requirements are made sufficiently elastic to serve primarily the purpose of securing improvement of school building conditions. In many cases it is not possible to secure ideal conditions."

(To be continued.)

Heating, Ventilating and Plumbing Apparatus to Be Featured at the Panama-Pacific Exposition.

Included in the exhibits at the forthcoming Panama-Pacific International Exposition in San Francisco, commencing February, 1915, will be over thirty classifications of heating, ventilating and plumbing apparatus. These will be distributed among seven of the eleven main exhibit buildings. No charge is made for exhibit space, or for convention halls, a $1,000,000 permanent auditorium, seating 18,000 people, being provided for the hundreds of conventions and international congresses that will be held during the progress of the fair.

In the Palace of Varied Industries will be plans and models showing methods of heating buildings, factories and homes; plans and models for sanitation and ventilation of kitchen and living rooms; for natural ventilation and ventilation by exhaustion; up-draft ventilators; ventilators operated by wind, by differences of temperature, and by mechanical means; methods of conveying and distributing steam, hot water and hot air; laundry equipment; equipment of dyeing, scouring, sweating and bleaching; coal, gas and wood heaters, furnaces and boilers; radiators; ranges of all kinds; accessories to heating and ventilation, self-registering thermometers, pyrometers and anemometers; cocks and thermostats, and chimney, flue, fireplace, hearth and heater fittings. A special group is devoted to appliances for the manufacture, distribution and uses of gas.

In the Machinery Palace will be shown heat insulating materials, fire fighting apparatus, steam engines, boiler systems, fuel economizers and the like. The Palace of Liberal Arts will house the exhibits having to do with house ventilation, fire escapes, arrangements for preventing and extinguishing fires, in theatres, electro-thermal processes, furnaces, ovens, etc., for chemical laboratories and electrical furnaces.

The displays in the Palace of Mines and Metallurgy will include equipment for and methods of ventilating and lighting mines, and for preventing explosions and for fighting mine fires; also smelters, blast furnaces, etc. In the Palace of Transportation will be shown the operation of engine houses, fuel and water supply; heating, lighting, ventilating, cleaning, watering, refrigeration and pre-cooling of cars, and marine equipment, including apparatus for heating, lighting and supplying air and ventilation for ships. The displays in the Palace of Horticulture—the largest and most beautiful structure ever erected for such a purpose—will include methods and devices used in frost-fighting, orchard heaters and vaporizers, and methods of thawing and equipment for processing fruits, and for handling nuts, olive products, raisins, etc., where artificial heat is required.

The novel and convincing exhibits covering human welfare, sanitation, heating, lighting and ventilation of factories and other buildings to be installed in the Palace of Social Economy and Education will be illlustrated by unique automatic models made of wax, glass and other materials by the greatest European scientific experts in this line, Dr. Philip Rauer, who created the wonderful exhibits at the exhibitions in Dresden, Munich and Lyons.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL PLANTS.

Central Steam Heating. J. Grant De Remer. Considers features important to the profit of the service. Third and last article of a series. 3000 w. Eng. Mag.—April, 1914. 40c.

FACTORIES.

The Lighting, Heating and Ventilation of Factories and Workshops. Vivian B. Lewes. Read at a conference of manufacturers. Discusses the requirements and difficulties. 1500 w. Archt., London—March 6, 1914. 40c.

FAN TEST.

Test of 30-Inch Keith Fan. Leo Loeb. Report or test made at U. S. Naval Experiment Station, Annapolis, to determine the speed and discharge required to maintain pressure of 4, 5 and 6 ins. within the test chamber against several blast areas. Illustrated. 3500 w. Jour. Am. Soc. of Nav. Engrs.—February, 1914. Price on application.

American Institute of Chemical Engineers.

Among the papers to be presented at the sixth semi-annual meeting of the American Institute of Chemical Engineers, in Troy, N. Y., June 17-20, are the following:

"Ozone in Ventilation," by Prof. J. C. Olsen and W. H. Ulrich.

"The Present Patent Situation," by M. Toch.

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LIKE so many suggestions that have been advanced by ventilation enthusiasts, the actual figures involved in the cost of recirculating indoor air do not seem to have been duly considered. On the face of it the fuel economy of recirculation, when compared with the use of outdoor air exclusively, is self-evident.

The cubic contents of the air washer and accompanying appliances are such that the total capacity of the contained water for absorption of body products is small. The question resolves itself, therefore, into one of recirculating the the air and wasting the water from the air washer, or using all outdoor air and recirculating the water in the washer, to insure a proper quality of air for the occupants. It certainly would be unreasonable to expect proper results if both water and air were recirculated. The use of any portion of indoor air requires its cooling and dehumidifying.

This opens up a field for discussion which has been taken advantage of by a writer whose conclusions, as presented on another page, must at least furnish food for thought. It will be noted that his discussion applies strictly to the recirculation of air in schoolrooms and his conclusions that the total economy would be questionable in most cases will, if supported by the facts, have an important bearing on further adoption of such methods.

ASIDE from the economical aspect, the desirability of providing means for air recirculation may be the principal consideration, and we are glad to be able to supplement the discussion just referred to with an instance of a school equipment built with the recirculation features and containing many other novel points as well. This is one of the first applications of the results secured in the well-known Springfield tests and is carried out even to the extent of supplying almost double the usual quantity of air to the pupils. Its operation will no doubt furnish additional data that will show how far theory and practice agree.

THE FACT that so large and enthusiastic a class of students in heating and ventilation could be launched as that which has been holding its sessions in New York the past winter is an indication of the crying demand for such instruction, as well as a commentary on the failure of most educational institutions to provide such instruction. The young men who are connected with this field are determined to know more about their subject and the success achieved in New York is a good indication of what could and probably will be accomplished in other centers.

NATIONAL DISTRICT HEATING ASSOCIATION

Sixth Annual Convention, Rochester, N.Y., May 26-29 '14

The change of attitude on the part of public utility companies towards government regulation was easily the most important development reported at the sixth annual convention of the National District Heating Association, held in Rochester, N. Y., May 26-29, 1914. Whereas the public utilities were formerly opposed, as a rule, to such regulation, it was brought out forcibly that the time is coming and, in some instances, has come when the utility companies may well look upon government regulation as a blessing. In many cases the government commissions are standing between the companies and dishonest politicians and are serving to protect the utilities from exploitation.

In the same connection the point was emphasized that the utility companies are rapidly recognizing the advantages of dealing fairly and truthfully with the public and of taking the public into their confidence.

The program was unusually complete and occupied to the full the sessions allotted to it.

TUESDAY AFTERNOON, MAY 26.

The convention was called to order Tuesday afternoon, with President S. Morgan Bushnell in the chair.

Commissioner of Public Safety Charles S. Owen, on behalf of Mayor Hiram H. Edgerton, welcomed the delegates. Frederick B. Orr, of the Illinois Maintenance Co., responded for the association.

President Bushnell then delivered his address.

President's Address.

At the opening of this, the Sixth Annual Convention of the National District Heating Association, it may be interesting to trace briefly the development of central station, or district heating, and to note some of the reasons for the origin and growth of this association. In order to do this it will be necessary to go back to the first central stations which were installed, not for the distribution of heat nor for the distribution of power, but for the distribution of light.

About thirty years ago, the old Edison Company started a few central station plants in some of the large cities, and at that time supposed that it was simply establishing plants for the distribution of incandescent electric light, under the patents of Thomas A. Edison. Other systems of lighting followed soon after, and plants were established, not only in the larger cities, but also in smaller cities, until an electric lighting system became considered a necessity in every progressive town or village.

Soon after these plants were started, various types of motors were designed, and it was found convenient in very many places to substitute for the small steam engine and gas engine, electric power. During the first few years the power load was relatively unimportant, and was often an unwelcome addition to the station. The frequent on and off of motors, especially for elevator purposes was sometimes very disturbing to the stability of pressure of the smaller electric lighting systems, and in some cases it was only after considerable discussion between the elevator companies and the central station that such intermittent power users were connected to the lines.

As time went on, there was a rapid change in the situation. The supplying of power to motors for manufacturing plants, elevators and for railway use increased more and more rapidly, and we have now reached the point where, in some central stations, the lighting load is secondary to the main business of generating and distributing electrical power.

DEMAND FOR COMPLETE SERVICE.

Coincident with the growth of the

power demand, there arose and developed an insistent demand that the companies furnish a complete service. The three products of a mechanical plant, viz.: light, power and heat, can be furnished from a central station system of supply, and existing plants have often been forced by the competition of isolated plants and by new central station companies who would offer both heating and electric service, to reconstruct their system so as to supply complete service. The heating department constitutes the third and last development of the central station industry, and is a department which thus far has not reached the high stage of systematic and scientific development attained by its older brothers, light and power. Regarded as an unwelcome visitor, central station managers have been inclined to avoid the heating problem, and not until the past few years has there been an organized effort to collect and systematize information on steam and hot water heating so as to place them on an advanced, scientific basis. Many have hoped that the steam and hot water systems of the present might be eventually displayed by electrical heating, and that the ultimate solution of the problem would be a general use of electricity for heat, light and power. A glance at a few statistics will eliminate this idea.

COST OF HEATING BY ELECTRICITY.

778 foot pounds = 1 British thermal unit, or, in other words, it takes 778 foot pounds to raise 1 lb. of water one degree in temperature. We also know that 1 H. P. operated 1 minute equals 33,000 foot pounds. Accordingly, 1 H. P. minute equals 33,000, divided by 778, equals 42.416 B. T. U. Accordingly 1 H. P. hour equals 42.416 × 60, equals 2544.96 B. T. U. Reducing this to the unit of electricity, viz.: kilowatt hours, we have, I KWH equals 3411 B. T. U. At the present time, 2 cents per KWH is about the lowest price for commercial energy. At this rate, 1 cent would purchase 1706 B. T. U. in the form of electrical energy.

One pound of steam, as shown by steam tables, is equivalent to about 1000 B. T. U. At 50 cents per thousand pounds, which is the average rate for steam, 1 cent would purchase 20,000 B. T. U. in the form of steam. Accordingly, the relative amount of heat to be purchased for 1 cent between electrical and steam heating could be expressed by the relation between 20,000 and 1,700, which is the ratio of about 1:11.8. In other words, 11.8 times as much heat can be secured from steam for one cent as can be secured from electricity.

Prices for steam may vary somewhat above or below this figure, also prices for electricity may vary, but at the same time we can safely figure that the average cost of heating a building by electricity would run about ten times as much as the cost of heating it by steam. Accordingly, a store which can purchase steam heating for $50 per month, would be oblidged to pay about $500 per month for electrical heating, at the present rates. I doubt if even the strongest advocate of electrical heating would claim that there is much chance for competition under such conditions. It is evident, therefore, that in the field of distributing heat for buildings there is nothing which can compete with a system of either steam or hot water distribution.

GAS HEATING.

Another source of heat has been the product of the local gas companies. Although the gas range has taken the place, to a large extent, of former methods used in cooking, nevertheless the ordinary householder cannot afford to heat his entire premises by means of a gas stove or furnace except in districts supplied by natural gas. We are forced, therefore, to return to a system of steam or hot water heating as the most satisfactory means of warming the temperature of residences and other buildings.

ADVANTAGES OF CENTRAL STATION HEAT.

While these steam or hot water systems are usually handled by small individual furnaces, there are a number of reasons why it is desirable that this service be furnished from a central station source of supply. With the ordinary private residence, it is customary to burn hard coal in the furnace, this coal costing from $5 to $8 per ton. The central station heating company, by establishing its station near a railroad

and eliminating cartage expense, can secure soft coal suitable for use in large boilers at a price of $1.50 to $2 per ton. This makes a very great saving in the cost of producing heat. The fact that many central power and lighting stations are operating non-condensing engines and have a large amount of exhaust steam from these engines available for heating during the winter months, gives an additional saving over the cost of small independent heating plants. Of course, we must figure on the additional cost of installing pipe lines and the loss by condensation from these lines, but where the system is carefully installed, the primary saving should more than offset the secondary losses.

A new factor has arisen in connection with this problem, and that is the steadily growing demand for the conservation of our natural resources. The day is past when a manufacturing concern wishes to point to the banner of smoke issuing from its chimneys as proof that it is doing business. The requirements of cleanliness, sanitation and economy in our cities and towns demand that the burning of coal be turned over more and more to large boiler installations in order that there may be an opportunity for systematic and efficient firing, which obtains not only greater economy in steam production, but also the abolition of the smoke nuisance.

The field of central station heating is not restricted to the small consumer. It is especially in the case of the large consumer that the centralization has been compelled to take up the heating problem in order to meet the competition of the self-contained isolated plant. Central station managers are now becoming more and more convinced that if they are to secure a market for their power in large buildings, they must at the same time be prepared to deal intelligently with the question of heating those buildings.

CAUSE OF DISPUTE AS TO RELATIVE COST OF CENTRAL STATION SERVICE AND ISOLATED PLANT.

For years the cost of the production of electricity in an isolated plant has been a disputed subject. No one has been able to tell just where the cost of heating the building ended and where the cost of power for the building began. As a result, claims made by isolated plant engineers as to the cost of the production of electricity have followed closely the descending scale of prices for central station supply. Fifteen years ago, when central station energy was sold at from ten to twenty cents per kilowatt hour, the lowest claim by isolated plant engineers as to the cost of production was not less than five cents per kilowatt hour, and this only in the case of the largest plants. Today, in view of the central station competition which is placing the isolated plant more and more on the defensive, all kinds of claims are made as to the cost of producing current, varying from five cents per kilowatt hour down to nothing or less than nothing. It is a fact that the engineer of one office building claimed that he could heat the building cheaper in combination with furnishing electric light to the building, than if he simply operated the plant for heating. In other words, the current would cost less than nothing. This was the claim made before the installation was completed. The actual results in operating the plant have told a different story.

VALUE OF STEAM METERS IN SHOWING STEAM HEATING COSTS.

During the past five years, reliable steam meters have been connected to a large number of steam heating installations, and are now beginning to have accurate data as to the amount of steam required for heating a building of a given size. It is becoming easy to show in any new proposition that may arise, the probable cost of heating the building and the exact cost of electricity for the building, based on a certain number of kilowatt hours of use, and this can be compared with the actual operation of independent isolated plants of corresponding size. The great difficulty in the past has been that these estimates were not formerly based on metered records, but were engineering estimates which the ordinary owner or business man would feel unable to pass on, and accordingly the matter would be preferred to some engineer, either consulting or operating, for his advice. We are sorry to say that the advice seems sometimes to have been colored by self-interest on the part of the engineer.

THE INTERESTED PARTIES IN A GIVEN INSTALLATION.

In the case of a large metropolitan office building, the parties interested in the problem are:

(1) The central station, which desires to sell electricity;

(2) The manufacturing interests, who desire to sell dynamos, engines, and other apparatus required in an isolated plant;

(3) The consulting engineer, whose business consists largely in designing isolated plants;

(4) The operating engineer, the value of whose position depends to a considerable extent upon the installation of an isolated plant;

(5) The architect, whose commission on the building is increased by the installation of an isolated plant;

(6) The building manager, who is apt to consider that the responsibility of his position and consequently his salary, would be enhanced by the management of an independent, isolated plant;

(7) Lastly, the owner, who is anxious to operate the building as cheaply as possible.

It is obvious that if the central station can produce light, heat and power and sell to the owner cheaper than he can produce them is an isolated plant, the owner would very much prefer to deal with the central station, but if this action is taken it may lessen the profits of the five other parties interested. We are now approaching a time when the property owner of average ability can find out these figures for himself and draw his own conclusions. This data, which is so valuable, can be best obtained where the heating company provides service on a metered basis, and therefore knows the exact cost in each individual building.

We see that there is a field for district heating, both for the small consumer and the large consumer, and therefore we have an industry which has come to stay. We have already noted that the central station production of electricity for power, which at first seemed small and unimportant, has grown until it is on the point of surpassing the production of electricity for lighting. In view of the rapid changes made in the past few years, who shall say what shall be the limit to central station production of heating in the more scientifically planned city of the future?

The foregoing are some of the causes which have led to the development of the association which meets here today. Recognizing the logical demand existing for central station heating systems, also recognizing the need for a more and practical knowledge of the principles and facts in connection with this business on the part of central station companies, a group of central station heating men organized, four and a half years ago, the National District Heating Association. The first meeting was held in Columbus, Ohio, November 10, 1909; the following year it was held the fourth week of June, in Toledo, Ohio; the third Convention was held at Pittsburgh, Pa., the first of June, 1911; the fourth at Detroit, Mich., the second week in June, 1912; and the fifth at Indianapolis, Ind., the last week in May, 1913. The Association has grown from the group of nine men who met at Columbus to a membership of nearly three hundred, and this growth will probably continue. It marks the progress of an effort to bring the central station business to a more practical and scientific basis in connection with the general distribution of knowledge concerning the important facts connected with heating.

This association has worked side by side and harmoniously with the American Society of Heating and Ventilating Engineers, which occupies somewhat the same relative position to this association as the American Institute of Electrical Engineers holds to the National Electric Light Association. The engineering societies pay especial attention to the scientific and engineering features of the business, while the National District Heating Association and the National Electric Light Association are interested not only in the engineering features, but also in utilizing engineering and business talent to make a practical business success.

In 1912, both societies appointed members of a joint committee to take up certain engineering problems so that the two societies could work along side by side on matters of common interest. The work of this committee, which is called

the educational committee, the first year consisted largely in outlining the scope of the work to be attempted, while the committee during the past year has taken up the actual work of determining a code of rules and specifications to be used in connection with district heating.

We can therefore say that the central station heating stations which first began to be established about a quarter of a century ago, and have received their largest increase during the last decade, are beginning to systematize their information with a view of placing the business on the same plane as the older industries. The capital invested already runs well up into the millions while the number of companies in central station heating has been estimated at from three to four hundred.

The report of Secretary-Treasurer D. L. Gaskill showed the association to have passed through a successful year and to be in a satisfactory condition.

Receipts for the year, including last years' balance of $319.95, were $3,975.95. The year's expenses were $3,003.55, leaving a balance on hand of $972.40.

During the year 85 active and 15 associate members have been added, making a total of 100. There were 22 resignations from the active list and 6 from the associate, leaving the present membership 230 active members and 70 associates, or a total membership of 300.

The secretary favored special efforts to increase the associate membership list.

The chair appointed as the nominating committee W. A. Wolls, Columbus, chairman; A. D. Spencer, Detroit, and J. L. Hecht, Chicago. This committee reported at the evening session, and the ticket as proposed was formally elected at a later session.

NEW OFFICERS.

The new officers, as elected, are as follows:

President, W. R. Wetherell, Peoria, Ill.

First vice-president, D. S. Boyden, Boston.

Second vice-president, B. T. Gifford, Grand Rapids, Mich.

Third vice-president, G. W. Martin, New York.

Secretary-treasurer. D. L. Gaskill, Greenville, O.

Executive committee: S. Morgan Bushnell, Chicago; H. Almert, Chicago, and C. F. Oehlman, Denver.

During the Tuesday afternoon session the presence of former President John F. Hale, of the American Society of Heating and Ventilating Engineers, led the chairman to call on him for a few remarks.

Mr. Hale responded by relating the experience of the heating engineers' society in securing technical papers in time for publication in advance and emphasized the importance of securing such advance printing. He also urged support of the chair by the members present in participating in the discussions. He said there was a natural tendency to sit back and say nothing, but that the starting of a discussion, even though it be on some incidental matter, frequently led to something of value to all.

Mr. Hale's remarks were warmly applauded, and it was notable that the presentation of the report immediately following brought out a very full and animated discussion.

This report was that of the committee on underground construction, H. A. Woodworth, Indianapolis, chairman. A general review was given of the matter of design, construction, operation and depreciation. The report also took up efficiency of construction labor.

"The cost of underground heating mains," stated the committee, "installed by inexperienced persons will result in disappointment. There is no class of construction work which requires as much care as in the selection of apparatus or demands the direct attention of experienced men, as that of the underground heating mains. While it is true that underground heating mains properly designed, insulated and installed cost more than any other type of underground construction, it is also true that the return on the original investments are greater."

The report gave a formula for determining pipe line capacities, based on the D'Arcy formula, as published in B. T. Gifford's work on "Central Station Heating." The report discussed in detail

the selection of the kind of material to use for installing an underground heating system, depending on the character of the installation.

EVENING SESSION, MAY 26.

The evening session was devoted to a talk by H. S. Patterson, of the National Tube Co., illustrated by moving pictures, showing the progress of manufacture of welded iron and steel pipe. These were the same pictures as have been shown so successfully before numerous engineering bodies and consisted of four reels starting at the company's ore mines on the Mesaba Range in Wisconsin and continuing through the various steps to finished product.

WEDNESDAY MORNING, MAY 27.

The first speaker at the Wednesday morning session was Robert M. Searle, vice-president of the Rochester Railway & Light Co., who discussed "Public Policy of Utilities." Mr. Searle pleaded for the utmost frankness in dealing with the public. He stated that any responsible member of his organization was authorized to speak for the company, provided he told the truth. He cited numerous instances where the company had been able to settle complaints by getting in touch with complainants through a series of conferences. Mr. Searle also said that be believed in government regulation of public utilities, though opposed to government ownership.

Mr. Searle told of the way the electric wires and poles had been removed from the streets by making an agreement with property owners to run the wires through their back yards, the company being given easements in perpetuity for that purpose.

The report of the meter committee was presented by A. D. Spencer, Detroit, chairman, and contained further descriptions of new devices and data on the performance of steam flow meters and condensation meters. The committee also prepared a set of general specifications to be filled in from time to time, as the progress of development warrants. The new devices described included an integrating device for use with the new General Electric steam flow meter and the Bristol recording differential pressure recording gauge for use in connection with Pitot tubes or Venturi meters.

Following the discussion of the points brought out by the meter committee, a report was presented by the station record committee, A. P. Biggs, Detroit, chairman. Mr. Biggs exhibited a large scrap book containing record sheets, etc., which had been received from various sources by the committee and which were studied with great interest by the members. The scrap book was on exhibition during the convention and will be kept open for inspection permanently at the office of Secretary Gaskill, in Greenville O. The announcement was made that the scrap book will also be shipped to various points, as required. There are a total of 250 forms in the exhibit, which were submitted by 250 member companies.

As there was still some time left at the session, one of the items on the afternoon program was taken up, being a topic for discussion, presented by A. C. Rogers, Toledo, on "Expense of Operating Centrifugal Pumps vs. Double Acting Pumps." Mr. Rogers expressed the opinion that the development of the centrifugal pump gave promise of greater usefulness than ever. Other speakers on this topic were D. S. Boyden and J. L. Hecht.

AFTERNOON SESSION, MAY 27.

In many ways the most interesting session was that held Wednesday afternoon when a series of topics was taken up, the discussion in each case being opened by a speaker to whom the topic had been assigned.

These topics and the principal speakers were:

Hot Water Heating Under Forced Circulation, Thomas Donahue, Lafayette, Ind.

Some Effects of Utility Regulation as Affecting District Heating, D. L. Gaskill, Greenville, O.

Effect of Superheated Steam on Heating Systems, D. S. Boyden, Boston.

District Heating for Small Towns and Cities of 10,000 Population and Under, L. T. Mason, Hornell, N. Y.

Heat Losses from Buildings of Latest Construction, J. Byers Holbrook, New York.

Which is More Profitable: To Shut Off Steam at Night or Keep It on Continuously, E. L. Wilder, Rochester, N. Y.

Economic Advantages to Consumers of Central Station Heating Service Over Individual Heating Plants.

The topics were all presented in terse form and resulted in a series of snappy discussions that maintained the interest at a high point throughout the afternoon. Following are discussions of D. S. Boyden and E. L. Wilder.

Effects of Superheated Steam on Heating System.

By Davis S. Boyden

During the past decade, we have heard considerable discussion as to the economic value of superheated steam in performing certain work. Undoubtedly much of the favorable comment has been due to the successful development of the steam turbine utilizing superheated steam.

Superheaters are now designed for any commercial degree of superheat in both the self-contained and the separately fired types and manufactured to meet exacting specifications to accomplish the desired results of the various applications.

With a properly designed superheater installed in the boiler setting where the combined efficiency is no less than the boiler efficiency alone (and several authorities claim that the efficiency is higher with the superheater installed) there must be considerable boiler room economy in favor of the superheater.

Some of our larger district heating plants use at present the self-contained type, but as the live steam is used to augment the exhaust steam, any value the superheater may have to the efficiency of the heating system appears to be entirely neglected, and the writer has been unable to ascertain any reliable data based on actual operation. Therefore, it is not surprising that this topic for discussion has been suggested.

Let us compare the properties of dry steam at 5 lbs. pressure, no superheat, and steam at 5 lbs. pressure 100° superheat.

	Dry steam 5 lbs. pressure no superheat.	Steam 5 lbs. pressure 100°. sup.
Temperature	227° F.	327° F.
Volume occupied by 1 lb	20.2 cu. ft.	23.2 cu. ft.
Available heat	955. B.T.U.	1005. B.T.U.

Effect of Superheat.

Will increase the available heat 5.1%.
Will increase the volume of steam 14.0%.
Will increase the distribution losses due to condensation 64%.

It must be realized, however, that condensation in well insulated pipes is small —the 64% increase will effect only this loss and not the whole quantity of steam flowing.

The drop in pressure along the pipe would be greater with superheated steam than with dry steam, to transmit the same heat value.

The drop in pressure increases as the square of the weight and as the inverse of the density. The weight would increase as the inverse of the heat values, and as these do not increase as fast as the density decreases, the drop in pressure would be greater with superheated steam. However, this difference would be so small that it would have little effect on the economy of the plant.

Therefore, from the above, it is apparent that the best size of pipe for carrying the steam will be one having the sum of the radiation losses and friction losses a minimum. If we greatly increase the temperature, as with superheated steam, the radiation losses are greatly increased, and a smaller pipe should be used to obtain minimum loss. With the smaller size of pipe, both the radiation losses and the friction losses are increased and the total transmission losses thereby considerably increased.

Radiation from superheated steam pipes simply reduces the superheat; while moist steam takes care of radiation by condensation. Consequently, with superheated steam the trouble from condensation is less.

In considering superheated steam for heating apparatus, we must determine the amount of superheat desired, making due allowance for the physical condition of the steam as delivered from the boilers.

A boiler plant operating at 100 lbs. gauge pressure, which delivers live dry

steam to a 5-lb. heating system, delivers to the steam approximately 70° superheat. While an ordinary boiler plant as an average delivers steam having from 2 to 3% moisture and expanding to 5 lbs., evaporates this moisture, resulting in nearly live steam.

In discussing the merits of using superheated steam, we must have in mind a heating system which is theoretically correct to attain the greatest advantage offered by its use. For instance, with a single pipe system with returns coming back in the same pipe it is doubtful if the steam would ever be superheated from the last drip, to the radiator, due to the returning condensation.

ADVANTAGES.

Increased economy in boiler plant.
Smaller allowable pipe sizes.
Slightly reduced heating surface.
Lower first cost of installation.
No condensation noise or water hammer in distributing mains.

DISADVANTAGES.

Increase of distribution losses both in heat and friction.

Danger of severe burns from hot end of radiators.

Danger of scalding from leaks not apparent.

Disagreeable odors from overheated air and bronze paint.

Trouble with pipe and fitting from high superheat.

Increased loss due to leaking drips.

Slightly increased cost of maintenance.

But considering economy alone the advantages seem to be slightly with the superheated steam, when the system is such to warrant its use and properly designed for its application.

Is It More Profitable to Shut Off Steam at Night or to Keep It on Continuously?

By E. L. Wilder.

There are several considerations involved in this question as to whether it is more profitable to turn off steam at night or to keep it on continuously. These will have different weights when the question is applied to different situations and the resulting conclusion may not always be the same. There can be no general answer to this question that will apply to all conditions. More is involved than simply the question as to how much steam will be used or how much coal will be burned. In general, the method of operation which uses the least steam will be the most profitable, but this is not necessarily the case.

Let us consider, first, what happens to a room or building which has been heated to a temperature above the surrounding air and the supply of heat is stopped. Heat continues to radiate through the walls at a rate which is proportional to the temperature difference between the inside and the outside. This heat will be supplied by the energy which is stored in the walls, floors, and the contents and as these give up their heat the inside temperature will gradually fall. It is evident that at the end of the period during which the heat has been turned off the average temperature difference between the outside and the inside will be less than it would have been if the heat supply had been left on, and the inside temperature maintained at a uniform value. The storage heat, which has been given up during this period must of course be supplied when heat is turned on, so that this quantity does not enter into the economic equation. There is, however, a saving due to the lower average temperature difference.

Besides this lower average temperature difference there is another factor which affects the amount of heat transmitted. This is the coefficient of heat transmission. It is a fact that the principle resistance to heat transmission through any wall or window of ordinary construction is at the two surfaces, where the heat enters and leaves the wall or window. The surface resistance is affected by the condition of the air which is in contact with this surface. If the air is in motion the heat transmission is faster than if the air is at rest, and a rapid air motion given a higher coefficient than a slow one.

The formula developed by Grashof is ordinarily used in calculating this factor and as an illustration I have calculated the constants of heat transmission for three thicknesses of brick wall and for single glass under two conditions; one for inside air in slow motion and one for inside air at rest.

The values are as follows:

	Inside air in slow motion.	Inside air at rest.	Per cent. decrease.
8-in. brick wall.	.411	0.397	3.4
16-in. brick wall.	.315	0.309	1.9
30-in. brick wall.	.158	0.154	0.25
Single glass	.97	0.907	6.5

It is evident that the heat transmission is considerably influenced by condition of the air and that this effect decreases as the wall thickness increases. With the heat turned off there will still be slow motion of the air due to the cooling of that portion of which is in contact with the outside walls. I believe that we are fuliy warranted in saying that this air movement will be much slower with the heat supply shut off than with the heat on, whether this heat is supplied by direct radiation or through a hot blast system. The values given are not intended as an accurate measurement of the amount but as an indication of the order of magnitude of the difference in heat transmission, which may reasonably be expected.

Another fact which has a considerable bearing upon this question is that if the building is shut up at night and the steam is not turned off, the temperature is very liable to rise and cause an excessive temperature difference between the inside and the outside. Recording thermometer records taken in factories where steam was not turned off have shown that the temperature may easily rise to 80° F. and above.

The application of this method of running a heating system depends a great deal upon the rapidity with which heat must be supplied when it is desired to bring the temperature up to normal. When there is only a little more than sufficient radiation to supply the normal heat losses from the building it is evident that if the night temperature be allowed to fall much below the day temperature it will be a very difficult matter to get it back. This means that if this method of operation is to be applied the heating systems must be designed with some excess capacity. In order to apply this method partially, however, it is only necessary to provide such capacitv as is ordinarily considered good practice.

For example, during the three coldest winter months, December, January and February, the average temperature in Rochester is about 25° F., so that if a heating system is designed for zero weather there will be on the average a 35% excess heating capacity. During the whole heating season the average temperature is about 45° F., so that on the average the heating system, which is designed for zero weather, will be over twice as large as is necessary. This gives a capacity which will allow for the intermittent operation of the heating system, except in the very coldest weather.

In some industries it is not allowable to drop the temperature below a certain point because of the character of the work. An example of this is the manufacture of shoes, in which patent leather is used. Any decided lowering of temperature will cause the patent leather to crack and it is, therefore, necessary to maintain practically a uniform temperature at all times. Another example is the grinding of lenses, where a drop in temperature below a certain point will spoil all the work in progress.

The result of observations which I have made on the operation of the heating systems of several factory buildings, which are being heated by central station steam service has led to the conclusion that a saving of from 10 to 30% may be effected by the method of intermittent heating.

MORNING SESSION, MAY 28.

The Thursday morning session was opened with the reading of a paper on "Customers' Steam Heating Systems," by President-elect H. R. Wetherell, of Peoria, Ill. Mr. Wetherell's paper is reproduced in full on another page of this issue. In the ensuing discussion, Reginald Pelham Bolton advocated the use of check valves on the radiator outlets, which, he stated, would prevent the vapor from backing up into the radiator, a condition which he said was likely to obtain with the systems described. Mr. Wetherell maintained that with a properly-designed atmospheric system there would be no vapor in the returns. He recommended the use of water seals in preference to check valves.

George W. Martin, vice-president of

the New York Service Co., then read a paper on "Commercial Steam Heating in New York City." In connection with his paper Mr. Martin referred to the fact that 97 per cent. of the buildings built recently in New York City are using Edison service, and that an opportunity awaits the consulting engineers in the way of devoting their attention to the operating features.

Mr. Bolton gave interesting data on boiler room waste in connection with the cost of firing. He also urged the development by central heating companies of summer steam service as the cost of making steam in the milder months, where individual plants were installed, had been found to be excessive.

The morning session was concluded with the reading of the report of the rate committee by E. L. Wilder, chairman. Mr. Bishop called attention to the fact that a low rate does not necessarily mean a lower cost of heating while in a number of instances, where the rates were increased, the users became more careful in the use of the heating medium and the total cost to the consumers was actually less for the year than under the lower rates.

Before the session closed Mr. Boyden introduced a resolution of thanks and appreciation for the generous hospitality extended by the local committee. Mr. Donahue offered another resolution thanking the exhibitors and the trade press for their interest and co-operation.

A motion was also adopted that copies of franchises as awarded to central station heating companies be collected and added to the association's records.

THURSDAY AFTERNOON, MAY 28.

The report of the station operating committee, Byron T. Gifford, was the first item on the program for the closing session. In the absence of Mr. Gifford the report was read in abstract by Secretary Gaskill. It consisted of 79 printed pages, covering the items of boilers and general operating conditions. The latter subdivision is divided into conditions relative to a steam heating plant and those relative to hot water heating plants. Mr. Bolton, in the course of a discussion of the report, declared that the boiler of the future will have vertical, rather than horizontal, water tubes and that boilers of 5,000 H. P. may also be looked for.

The meeting concluded with the report of the educational committee D. S. Boyden, chairman, which is a joint committee working with The American Society of Heating and Ventilating Engineers in preparing a general code of good practice. The report contained a mass of data on pipes sizes and radiation, steam meters, flanges and flanged fittings, and air leakage. Other portions of the report covered the prevention of accidents, test of low pressure steam vegetable cooker and an analysis of the effect of meteorological conditions on heat output of a district heating plant, the information being furnished by G. E. Chapman and the deductions by H. W. Whitten. The report recommended that invitations be extended to the National Electric Light Association and to the American Society of Mechanical Engineers to co-operate with the educational committee.

After a discussion of this report the convention adjourned.

THE ENTERTAINMENT.

On Tuesday afternoon the ladies were taken in automobiles for a ride through the parks and residential sections of Rochester.

Wednesday morning was devoted to shopping tours and in the afternoon, in spite of a thunder shower shortly before their departure, the ladies were taken for a sail on Lake Ontario. In the evening the delegates to the convention and the ladies attended the Lyceum Theatre as the guests of the association.

On Thursday, following a card party at the Seneca Hotel in the morning, the ladies were taken by automobiles to the Oak Hill Country Club where tea was served. That evening the association gave an informal dance at the Seneca Hotel.

Immediately after the close of the convention a large party visited the works of the Taylor Instrument Companies in Rochester, and was taken over the plant by a corps of guides. The various processes of the thermometer manufacture and those covering the firm's other products were investigated and upon the completion of the inspection each visitor was presented with an attractive souvenir in the shape of a table thermometer.

American District Steam Company's Outing

The event which everybody had been waiting for and which marked the climax of the convention was the all-day outing

on Friday arranged by the American District Steam Company and carried out under ideal weather conditions. The trip consisted in taking the delegates and guests by special Pullman train first to Lockport, thence to the company's plant in North Tonawanda and from there to Niagara Falls. The total number of guests was 103.

At Lockport the party was carried in sight-seeing cars to inspect the first central station heating plant built in the United States which was installed in 1877 by the American District Steam Company. After viewing the system of locks which originally gave the city its name, the party returned to the train and was carried to the company's plant, the train being switched directly into the yard. Here luncheon was served and the ensuing hour devoted to an inspection of the firm's various processes of manufacture, special interest being taken in the construction of its wood casing for underground heating mains.

The start for Niagara Falls was made early in the afternoon and on arrival at the Clifton House the party proceeded in trolley cars through the gorge. On its return dinner was served at the Clifton House, followed by an hour of dancing. The return trip to Rochester was made via Buffalo, where the western members left the train.

The general sentiment of the entire party on the lavish hospitality extended by the American District Steam Company was, perhaps, best expressed in a resolution offered by a number of members to the effect that "You have heated our cities, streets, houses and homes, but never have you done all of that as you have warmed our hearts to you this day. We assure you this warmth will not know a season."

The entertainment committee was composed of R. D. De Wolf, chairman; H. C. Ward, secretary; E. L. Wilder, treasurer; R. J. Barker, L. Lindsay, E. L. Long, W. F. Devendorf, L. B. Swift, H. S. Welsh, Frank Falls, J. L. Williamson and F. P. Hoffman, all of Rochester; C. R. Bishop and W. J. Kline, of North Tonawanda, N. Y.; H. L. Coleman, Geneva, N. Y.

The contributors to the entertainment fund are:

American Blower Company.
American District Steam Company.
Armstrong Cork Company.
The Bigelow Company.
A. M. Byers Company.
The Direct Separator Company.
The Empire Gas and Electric Company.
The Garlock Packing Company.
General Electric Company.
Harrison Safety Boiler Works.
H. R. Heinicke, Inc.
Jenkins Brothers.
Johnson Service Company.
Keasbey and Mattison Company.
M. W. Kellogg Company.
Kieley and Mueller.
Nelson Valve Company.
Pittsburg Valve, Foundry and Construction Co.
Wm. Powell Company.
Richmond Radiator Company.
Ric-Wil Underground Pipe Covering Company.
Rochester Railway and Light Company.
Standard Regulator Company.
Shipley Construction and Supply Company.
Samuel Sloan and Company.
B. F. Sturtevant Company.
Taylor Instrument Company.
Vacuum Oil Company.
H. F. Watson Company.
Westinghouse Electric and Manufacturing Co.
Westinghouse Machine Company.
A. Wyckoff and Son Company.
H. W. Johns-Manville Company.

AMONG THE EXHIBITORS.

H. W. Johns-Manville Co., New York, showed a full-sized cross-sectional model of J-M sectional underground conduit installation, in addition to its line of conduit for high and low pressure steam and hot-water service, and a variety of packings for central station heating work. Those representing the company were W. H.. McElraevy, manager of the packing department, New York; F. J. Medway, manager of the contract department, New York, and L. Lindsay, Rochester representative.

American District Steam Co., North Tonawanda, N. Y., exhibited its line of steam specialties for central heating work, also models of the devices used in the atmospheric system of heating, both for use with central heating systems and for individual low pressure heating systems. The company's representatives present were Robert Hall, C. J. Dudley, R. C. Holley, C. A. Gillham, H. C. Kimbraugh, Walter J. Kline, C. A. Williams, H. A. Austin and Lloyd Howell.

V. D. Anderson Co., Cleveland, O., had samples of the Anderson model D steam trap, air trap, horizontal and vertical steam separators and safety water columns. Joseph H. Meyer was in charge.

Jenkins Bros., New York, showed samples of the well-known Jenkins Bros.' valves, which were supplemented by an intermittently-illuminated sign emphasizing the company's trade-mark. C. F. Beckwith had charge of the company's interests.

Taylor Instrument Co., H. and M. Division, Rochester, N. Y., had an exhibit of its electric distance reading thermometer outfit; also its line of recording and indicating thermometers for superheated steam feed water, condenser water, economizers and flue gas; also mercury vacuum gauges and mercury absolute pressure gauges; and automatic temperature regulators. L. B. Swift represented the company.

Armstrong Cork Co., Pittsburgh, Pa., displayed its Nonpareil high-pressure pipe coverings.

National Air Cell Covering Co., Brook-

lyn, N. Y., showed types of its Pyrobestos pipe coverings for underground or exposed steam or hot water piping, designed to be water and fireproof, in addition to their heat insulating qualities. This exhibit was in charge of G. Clarence Hall.

Michigan Pipe Co., Bay City, Mich., had a display of its wood pipe for hot water return lines, as well as types of Michigan tin-lined wood coverings, with shells running from 2 to 4 in. in thickness. The company was represented by Harry B. Smith, Jr.

Wyckoff & Sons Co., Elmira, N. Y., showed a section of its 10-in. Wyckoff improved steam pipe covering, with 3¼-in. shell.

Central Station Steam Co., Detroit, Mich., had an exhibit consisting of types of its double "Style A" expansion joint, a working model of the Detroit rotary condensation meter, service separators for use on service connections, and screens for taking the dirt out of the return lines before entering trap or meter. The company was represented by J. V. Redfield, F. A. Green and W. R. Owen.

Warren Webster & Co., Camden, N. J., displayed its line of steam specialties for use in connection with central heating systems, also samples of its expansion joints, high and low-pressure steam traps, vacuum governors, and the Webster modulation valve for use at the radiator inlet and the Webster syphon valve at the radiator outlet. The company distributed clever souvenirs in the form of paper-weights and celluloid rules. Those present for the company were John F. Hale, general manager, and F. H. Montreuil, of Camden.

The Bigelow Co., New Haven, Conn., exhibited a model installation of the Bigelow-Hornsby water tube boiler for powerhouse work. Elaborate catalogues showing different types of this style of boiler were distributed to those interested. S. H. Barnum, vice-president, was on hand in the interest of the company.

The Wm Powell Co., Cincinnati, O., manufacturer of the Powell valves and other engineering specialties, was represented by W. J. Leonard.

Registration List.

ACTIVE MEMBERS.

Biggs, A. P., Central Heating Co., Detroit.
Bettis, A. E., K. C. Heating Co., Kansas City, Mo.
Binder, Chas. G., Roch. Ry. & Lt. Co., Rochester.
Bly, G. D., Monarch Supply Co., Toronto.
Boyden, Davis S., Edison Elec. Illum. Co., Boston.
Bushnell, S. Morgan, Illinois Maintenance Co., Chicago.
LaWolf, R. D., Rochester Ry. & Lt. Co., Rochester.
Donohue, Thos., General Service Co., Lafayette, Ind.
Flechsenhaar, Geo. L., U. & C. Ry. Gas Elec. Co., Champaign, Ill.
Gaskill, D. L., Secretary, Greenville, O.
Green, Chas. H., 132 Nassau St., New York.
Gill, L. W., Queens University, Kingston, Ont.
Gottwald, C., Ric-Wil Underground Pipe Covering Co., Cleveland, O.
Hecht, J. P., Public Service Co. N. Ill., Chicago.
Higgins, George D., Murphy Power Co., Detroit.
Hirschfeld, C. F., Detroit Edison Co., Detroit.
Holley, R. C., American District Steam Co., N. Tonawanda, N. Y.
Irwin, R. H., Berlin Public Service Co., Berlin, Wis.
Jacob, Aug., Central Heating Co., Detroit.
Kellogg, Henry B., Central Heating Co., Detroit.
Kerth, Geo. J., Overbrook Steam Heat Co., Philadelphia.
Martin, Geo. W., New York Service Co., New York.
Marsh, R. C., Public Service Co., N. Ill., Chicago.
Mason, L. T., Hornell Electric Co., Hornell, N. Y.
Munroe, Chas. C., Central Heating Co., Detroit.
Oehlmann, C. J., Denver Gas Electric Co., Denver, Col.
Orr, Fred. B., Illinois Maintenance Co., Chicago.
Rissberger, A. C., Roch. Ry. & Lt. Co., Rochester.
Rogers, A. C., Toledo Ry. & Lt. Co., Toledo.
Ross, Fred. C., Carroll Lt. & Ht. Co., Carroll, Ia.
Ruth, H. A., Helena Costume Co., London, Ont.
Spencer, A. D., Central Heating Co., Detroit.
Spiehler, C. H., Dayton Power & Lt. Co., Dayton.
Stewart, R. Q., Public Service Co., N. Ill., Chicago.
Trombley, Jas., Central Heating Co., Detroit.
Walker, Frank, Green-Swift Co., London, Ont.
Wilder, Edward L., Roch. Ry. & Lt. Co., Rochester.
Wetherell, H. R., Central Illinois Light Co., Peoria.
Wolls, W. A., Col. Pr. & Lt. Co., Columbus.
Woodworth, H. A., Merchants Ht. & Lt. Co., Indianapolis.
Bendure, E. M., Economy Steam Htg. & Elec. Co., Sedalia, Mo.
Bolton, R. P., 55 Liberty St., New York.
Bishop, Chas. R., American Dist. Steam Co., N. Tonawanda.
Bascome, G. L., Cohocton Lt. & Heat Co., Scranton, Pa.
Carlton, W. G., Grand Central Terminal, New York.
Gillham, C. A., American Dist. Steam Co., Boston.
Hornung, J. C., Chicago.
Hagenah, R. E., Springfield Gas & Elec. Co., Springfield, Ill.
Noecker, F. M., Renova Elec. Lt. Ht. & Pr. Co., Renova, Pa.
Pond, H. O., Westinghouse C. K. Co., New York.
Reinicker N. G., Central Heating Co., Detroit.
Rider, A. L., Baltimore, Md.
Wurster, John T., Iowa Ry. & Lt. Co., Cedar Rapids.
Wells, W. H., American District Steam Co., N. Tonawanda.

ASSOCIATE MEMBERS.

Austin, H. A., American District Steam Co., Lockport, N. Y.
Barnum, S. H., The Bigelow Co., New Haven, Ct.
Beckwith, Chas. F., Jenkins Bros., New York City.
Devendorf, Wm. F., Rochester.
Dudley, C. J., American District Steam Co., N. Tonawanda.
Donnelly, Jas. A., 132 Nassau St., New York.
Falls, Frank H., Rochester.
Green, F. A., Central Sta. Steam Co., Detroit.
Hall, G. C., Nat'l Air Cell Cov. Co., Brooklyn.
Hartman, Thos. L., Armstrong Cork Co.
Hale, J. F., Warren Webster & Co., Camden, N. J.
Hall, Robt., American District Steam Co., N. Tonawanda.
Howell, Lloyd, American District Steam Co., Chicago.
Keily, W. E., Electrical World, Chicago.
Leonard, Wm. J., Wm. Powell Co., Buffalo.
Long, E. L., Armstrong Cork Co.,
Lindsay, L., H. W. Johns-Manville Co., Rochester.
McElraevy, Wm., H. W. Johns-Manville Co., New York.
Medway, F. J., H. W. Johns-Manville Co., New York.
Meyer, Henry, Cit. Mutual Heating Co., Terre Haute, Ind.
Meyer, Jos. H., V. D. Anderson Co., Detroit.
Montreuil, F. H., Warren Webster & Co., Camden, N. J.
Owen, W. R., Central Sta. Steam Co., Detroit.
Pratt, Louis A., Heat Publishing Co., Detroit.
Swift, Lewis B., Taylor Instrument Co., Rochester.
Smith, Henry B., Jr., Michigan Pipe Co., Bay City, Mich.
Shaw, L. S., Westinghouse Machine Co., Chicago.
Tyler, E. B., Tyler Underground Heating System, Pittsburg.
Tuke, Harry A., Heat Publishing Co., Detroit.
VanWinkle, F., "Power," New York.
Welsh, Harry S., Samuel Sloan & Co., Rochester.

Williamson, J. T., B. F. Sturtevant Co., Rochester.
Ward, H. C., General Electric, Rochester.
Walker, J. H., Central Heating Co., Detroit.
Woolley, R. E., General Electric Co., Schenectady.
Armagnac, A. S., Heating and Ventilating Magazine, New York.
Barker, Robt. J., Westinghouse Co., Rochester.
Clemens, Chas. A., Connellton Sewer Pipe Co., Connellton, Ind.
Carson, C. B., Taylor Instrument Co., Rochester.
Jones, Wm. T., Thermograde Valve Co., Boston.
Kimbrough, H., American District Steam Co., N. Tonawanda.
Kline, Walter J., American District Steam Co., N. Tonawanda.
Leech, C. B., Practical Engineer, Chicago.
Patterson, H. S., National Tube Co., New York.
Redfield, J. V., Central Sta. Steam Co., Detroit.
Sutphen, Peter O., A. Wyckoff & Son Co., Elmira.
Stokes, C. M., Ric-wil Underground Co., Morristown, Pa.
Tobias, Adrian, Westinghouse Elec. Mfg. Co., Pittsburg.
Winslow E. DeF., Domestic Engineering, New York.
Wakeman, E. C., The Wilkes Barre Co., Wilkes Barre, Pa.
Whitten, H. W., Chamberlin Metal Weather Strip Co., Boston.
Williams, C. S., American District Steam Co., N. Tonawanda.

Ladies Present.

Read, C. P., Power Specialty Co., New York.
Mrs. A. E. Bettis, Kansas City, Mo.
Mrs. G. D. Bly, Toronto, Can.
Miss Gladys Bly, Toronto, Can.
Mrs. Wm. F. Devendorf, Rochester, N. Y.
Mrs. Thos. Donohue, Lafayette, Ind.
Miss M. A. Falls, Rochester, N. Y.
Mrs. D. L. Gaskill, Greenville, O.
Mrs. C. D. Hess, Rochester, N. Y.
Miss Josephine Mason, Hornell, N. Y.
Miss Elsa Meyer, Terre Haute, Ind.
Mrs. C. F. Oehlmann, Denver, Col.
Mrs. S. B. Swift, Rochester, N. Y.
Mrs. E. B. Tyler,
Mrs. H. C. Ward, Rochester, N. Y.
Mrs. J. L. Williamson, Rochester, N. Y.
Miss Mildred Welsh, Rochester, N. Y.
Mrs. H. A. Woodworth, Indianapolis, Ind.
Miss Bernice Searles, No. Tonawanda, N. Y.
Miss Nellie M. Penfold, No. Tonawanda, N. Y.

Dinner of New York Heating Class.

Following a successful season, both in point of the number of students interested and the enthusiasm shown, the class in heating and ventilating engineering which has been conducted in New York the past winter by Charles A. Fuller, of Clark, MacMullen & Riley, closed its work for the year with a dinner at the Wool Club, New York, May 25. The diners, including members of the class and their guests, numbered nearly 50. Frank K. Chew was toastmaster and opened the speech-making by calling attention to the remarkable progress already made by the class, which includes 36 paid-in members, with an average attendance during the winter of 28. He then introduced the speakers who were Charles A. Fuller, the instructor of the class; Jas. A. Donnelly, Walter S. Timmis, George G. Schmidt, Homer Addams, F. T. Chapman, M. J. Callahan and John Armour.

The organizers of the class came in for many congratulations on the success of their efforts and the speakers urged the continuance of the class as a permanent institution.

Others present, in addition to those mentioned, are as follows:

Edward Storms, J. B. Garfield, T. A. Reynolds, R. Kinzel, A. D. Hoxie, M. J. Sage, F. A. Rupp, R. D. Mathews, Frank Klein, J. D. McDonough, E. A. Munroe, A. B. Munroe, W. E. Mason, E. A. Kingsley, D. J. Lehmann, H. W. Curry, J. H. Darts, H.

DINNER OF THE CLASS IN HEATING AND VENTILATING ENGINEERING, WOOL CLUB, NEW YORK, MAY 25, 1914.

L. Janet, H. H. Moffitt, W. G. Le Compte, A. L. Engle, C. G. Brunner, W. Ennis, Chas. H. Bayer, Harry Stokes, W. S. Rich, Benj. Chirghrin, A. K. Sage, D. N. Heymann, Chas. A. Munroe, Budd Strader, G. Petersen, L. Maxwell Peabody, Homer Frink, Wm. H. Driscoll, Gustave A. Dornheim, Chas. Miller, Chas. Hillman and T. Clark.

A New Heating Journal.

A new monthly journal devoted to the central station heating field made its first appearance at the convention under the name of "Heat." The magazine is published by the Heat Publishing Co., Detroit, Mich., with the following officers: President and manager, Harry A. Tuke; vice-president and editor, Louis A. Pratt; treasurer, Royal T. Bates; secretary, William M. MacLachlan.

Exhaust Steam and Vacuum Steam Heating.

A concise statement of the principles involved in the use of exhaust steam in connection with a vacuum steam heating system is contained in a paper by T. J. Coughlan, read in London recently:

After steam has passed through the engine, parting with its energy, it arrives in the exhaust-pipe in a spent condition; but we know that so far as its heat condition is concerned, every pound of it contains a sensible heat of 212° F. and a latent heat of 966° F., so that, roughly, 1,000 heat units per pound can be obtained from it by condensation.

We know, also, that not more than one-sixth of the exhaust steam can be utilized in heating the feed-water, and that if the remainder is turned into and compelled to traverse long ranges of piping, the piston of the engine during that period of the stroke when it is discharging the exhaust will be under a *back pressure;* that is, will have a resistance to overcome, which may even amount to 25% of the mean effective pressure of the steam on the piston. For assuming that the initial steam pressure is 80 lbs., and the steam is cut off at one-fourth stroke, the mean effective pressure will be about 42 lbs.; and if the back pressure necessary to circulate the steam is 10 lbs., the power of the engine would be thereby reduced to 23.8%.

If the engine has an automatic cut-off, and normally cuts off at 35-100ths of its stroke, and requires to generate the power 25.7 lbs. of steam per horsepower per hour, the effect of a 10 lbs. back pressure would be to decrease the range of expansion to 50-100ths of the stroke, and thereby to increase the steam consumption to 29 lbs. per horsepower per hour—a difference of 3.3 lbs. of steam per horsepower per hour.

Back pressure on an engine results in a loss of power, or requires an increase in fuel consumption, or both, according to the relation between the power and heating requirements. Without back pressure, the economy resulting from utilizing the exhaust steam is obvious.

From what has just been said it is clear that to raise its initial pressure would be to put on back pressure, which is to be avoided, and consideration of the matter appears to indicate the alternative, i.e., to clear the air from the path of the steam and so remove the principal impediment to circulation. This is the main idea from which the vacuum system has been built up to its present advanced stage of efficiency.

Business Chances.

Washington, D. C.—Bids will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until June 10, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Lake City, Minn. One story and basement, 3,800 sq. ft. ground area.

Until June 11, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Bennettsville, S. C. Two stories and basement, 3,800 sq. ft. ground area.

Until June 12, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Winchester, Tenn. Two story and basement, 3,800 sq. ft. ground area.

Until June 13, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Covington, Tenn. Two story and basement, 3,800 sq. ft. ground area.

Until June 15, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Macomb, Ill. Two stories and basement, 4,200 sq. ft. ground area.

Until June 15 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at McPherson, Kan. Two stories and basement, 3,800 sq. ft. ground area.

Until June 16, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Grenada, Miss. Two stories and basement, 3,800 sq. ft. ground area.

Until June 16, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Gastonia, N. C. One story and basement, 4,810 sq. ft. approximate ground area.

Until June 17, 1914, for construction complete, including mechanical equipment, etc., of the U. S. Post Office and court house

at Jackson, Ky. Three stories and basement, 5,000 sq. ft. ground area.

Until June 17, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Burlington, N. J. Two stories and basement, 3,800 sq, ft. ground area.

Until June 18, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Mount Vernon, Ill. Two stories and basement, 5,390 sq. ft. approximate ground area.

Until June 18, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Hanford, Cal. One story, mezzanine and basement, 4,515 sq. ft. approximate ground area.

Cork Sheets for Brewery Insulation.

The keen competition between brewing companies has brought about the most careful study of every structural detail that could tend to improve quality or reduce the cost of production. The Home Brewing Company, of Newark, has made a special study of these matters, and recently placed an order for the insulation of those departments requiring the most accurate regulation of temperature with J-M pure cork sheets, made by the H. W. Johns-Manville Co., New York. These sheets, it is stated, contain an unusual number of "dead air" cells and are also non-absorbent, while pains are taken in their manufacture to prevent their rotting or crumbling.

Trade Literature.

TAKING THE ATOMS OUT OF ATMOSPHERE is the title of a clever circular calling attention to the Ilg self-cooled motor propeller fans, made by the Ilg Electric Ventilating Co., Chicago, and adapted for use for ventilating factories, theatres, restaurants, schools, offices, etc.

BAYLEY HEATING, VENTILATING AND DRYING APPARATUS, BLOWERS AND EXHAUST FANS is the title of a new and comprehensive catalogue published by the Bayley Mfg. Co., Milwaukee, Wis. In addition to showing the Bayley steel plate and plexiform fans, pulley, engine, motor and turbine driven, the catalogue also takes up the company's line of sectional base heaters and illustrates typical arrangements of fans and heaters. The data and charts are conveniently arranged for quick reference purposes, the catalogue concluding with illustrations of the Bayley blast gates and steam traps for high pressure steam. Size 6x9 in. (standard). Pp. 96.

SPRAGUE ELECTRIC HOISTS, in capacities from one-half to six tons, are featured in a new catalogue received from the Sprague Electric Works, New York. These hoists are designed to fill the gap between the handchain block and the large traveling crane. Numerous illustrations of the various types, showing, in many cases, their particular uses, are included.

Fan Engineering Hand Book.

A remarkable illustration of the interest taken by manufacturers of heating and ventilating apparatus in the development of the science is shown in the publication of the "Fan Engineering Hand Book," which has just been received from the Buffalo Forge Co., Buffalo, N. Y. The publishers state that this work, which has been edited by Willis H. Carrier, M. E., has been in preparation for the past three years. It is planned to directly advance engineering knowledge as applied to the properties of and the industrial handling of air.

The book contains 576 pages, with flexible black leather cover, rounded corners and gilt edges. The page size is 4¼ in. x 6 11-16 in. The book is thoroughly indexed and cross-indexed, and must prove a valuable reference work to all engineers interested in the industrial handling or control of air.

The scope of the book will be seen for the following outline of contents:

Part I.—Properties of air; weight; specific heat; relation of velocity to pressure; temperature; humidity and barometric pressure; dry bulb and wet bulb; psychrometric tables, etc.

Part II.—Applications; heating; ventilation; air washing; cooling and humidifying; drying; mechanical draft; exhaust systems; miscellaneous applications.

Part III.—Air ducts; pressure losses; nozzle effects; blast area; proportioning piping; friction of ducts; piping layouts.

Part IV.—Apparatus:

Section 1, Fans, their design, characteristics, types, horsepower and pressure; selection of fans; Section 2, Fan Testing; Section 3, Fan Capacities; Section 4, Fan Dimensions; Section 5, Heaters; Section 6, Air Conditioning Apparatus; Section 7, Engines; Section 8, Practical applications and data for the selection of apparatus.

There are over 400 pages of tables and charts and about 200 pages of text. The first edition is 5,000 copies and the book will be advertised for sale at $3.00 per copy, which, it is estimated, will be equivalent to the actual cost of production. The publishers emphasize the fact that the book does not undertake to cover the special field of heating and ventilating, but is confined to the use, design and application of the fan system apparatus, not only for heating and ventilating, but for mechanical draft, drying and humidifying, special exhaust and blow pipe systems, etc.

THE CONSULTING ENGINEER

"The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

32—Equalizing Pressure Between Boilers.

QUESTION: When using two boilers at the same time on a low-pressure gravity return steam system, how should the connections be made so as to equalize the pressure and insure against fluctuations of the water levels?

ANSWER: The proper method is shown in Fig. 1, although connections are often made differently and no complaints are heard, due to the favorable conditions under which the plant is operated. Complaints are also sometimes not registered, even when there is trouble, due to the fact that the operator believes there is no remedy.

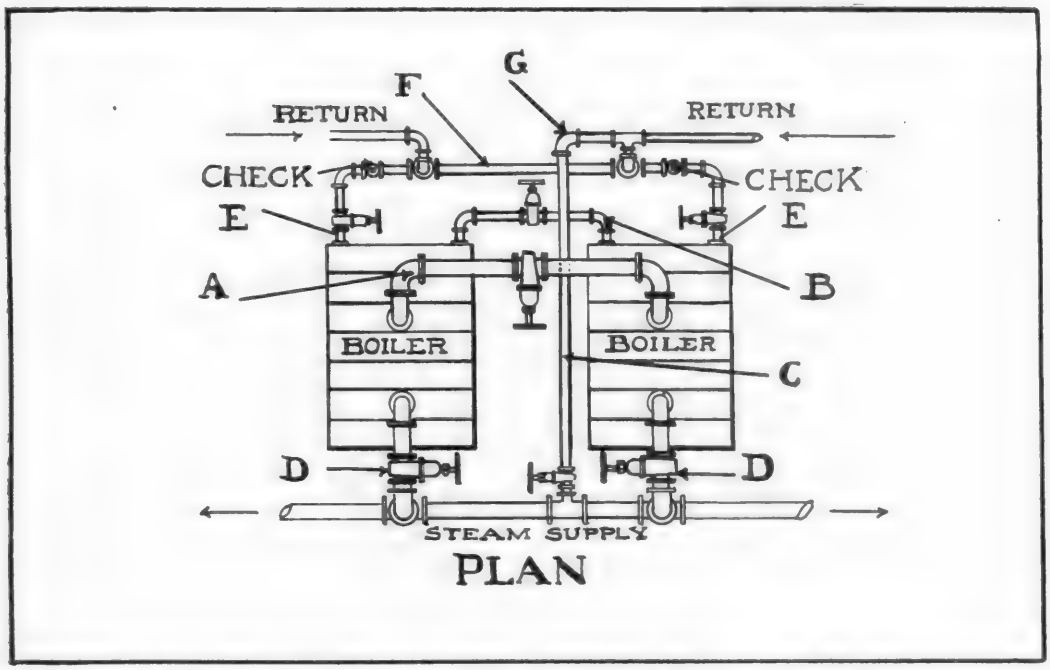
If large pipes are installed and there is ample distance between the radiation and the water line of the boiler, greater liberties may be taken without endangering the successful operation of the plant.

Where two boilers are connected to the same chimney, they will seldom steam exactly the same, and when one is freshly fired the unequal work will cause the water levels to vary.

In Fig. 1, D D are the main steam connections to the system and E E are the returns to the boilers, preferably connected into a header. A and B are equalizing pipes which should be the size of the steam and return to each boiler for the purpose of equalizing the pressure and maintaining the water levels in either boiler at the same point, regardless of the work on either boiler. They should be valved, in order that the boilers may be operated separately.

Positively no steam or return connections should be made to either of these pipes, as they act in the same manner as the connections to the water column carrying the water gauge. If they are connected in this manner, the water level will remain the same in both boilers under all conditions, and the return condensation will distribute properly to each boiler.

Connection C should only be made where there is a dry return above the water line of the boiler in order to prevent the water from passing out of the boiler into the return. If



CROSS CONNECTIONS BETWEEN TWO BOILERS TO EQUALIZE PRESSURE.

C is made to a wet return below the water line, it will be useless and possibly cause trouble. The water passes out of the boiler due to the pressure being less at some point farther away. This would cause connection C to transmit steam into the return, causing water hammer, and in any case would be exactly the same as the pressure transmitted from the boiler through the return pipe. For the above reason, connection C should never be made to a return below the water line.

USE OF CHECK VALVES ON RETURNS.

Although there is no objection to the use of check valves on the returns in this class of work, they are of little help if the arrangement of piping is faulty. It is quite a common practice where steamfitters have trouble to immediately put in a check valve which seldom, if ever, does any good unless there is a column of water on each individual check to assist in overcoming any difference in pressure. Where several returns come together and there is a chance to arrange the piping so that each has a separate column of water, checks prevent the return transmitting the highest pressure, which is the one doing the least work, from cutting the others off. The strong one shuts the check on the weak ones until the water accumulates on the weak return and overbalances the stronger return. If they are connected below the water line, the column of water will answer the purpose as well with the check as without. If there is not sufficient column of water available, the check will remain closed on the weak return and about the same result will occur, in spite of the check valve.

It is the same on the boiler. If there is not a sufficient column of water to force the water into the boiler without a check, the latter will not help matters, as the lack of pressure in the return system will cause the boiler pressure to close the check and the condensation will simply accumulate until sufficient power is available to open it and allow the return water to pass into the boiler.

WHEN CHECK VALVES ARE USEFUL.

When troubles occur in a heating system it is well to consider carefully the action of the check valve before deciding that it will remedy the trouble. It is pretty safe to say that if a job will not work without a check it will not work with one. Check valves are very useful for sudden changes in pressure, and the foregoing is not advice against their proper use; but care and thoughtfulness should be used as to exactly how they are going to help matters in any particular case. Many steam fitters make the check valve a panacea for all evils instead of properly reasoning in advance how this device is going to affect the result.

LEGAL DECISIONS

Implied Warranty of Heating Plant Where No Specifications Are Furnished.

An action was brought to foreclose a mechanic's lien for a balance claimed to be due under a contract for installing certain heating apparatus in a house erected by the defendants. The defendants proposed the erection of a house, drawing their own plans for the building. These plans, so far as prepared, only showed in a general way the size of the house and the arrangement and size of the various rooms of the dwelling. They did not show any arrangement of the heating apparatus, and there were no specifications of any kind touching those matters. The husband of the defendant took these general plans to the plaintiffs, who are plumbers and engaged in putting in heating apparatus. He stated he proposed to build a house of the character shown, and asked for figures on the heating and plumbing. In a few days after this, the plaintiffs sent the husband the following letter:

"We will agree to furnish the following fixtures and do all sewering inside of house for the connection of those fixtures, also leaving connections for four conductors; * * * The hot water boiler to be 40 gallon and connected with the other fixtures to hot and cold water pipes. The heating boiler to be an 18-2 W. Niagara boiler, and the radiation to be 3-col. 38 in., to the amount of 325 sq. ft. The boiler and all piping in cellar to be covered with asbestos covering and the radiators to be neatly bronzed. The plumbing and heating as above to be done in a workmanlike manner and for the sum of $380."

The husband later called on the plaintiffs and told them that the job was theirs. That constituted the transaction so far as the agreement of the parties is concerned. The plaintiff supplied the parts contracted for, and connected them up with the necessary piping. When, however, it was attempted to operate the heating system installed, it would not heat the house, and it was impossible to maintain the temperature of the rooms to a degree of warmth necessary to be comfortable in ordinary cold weather. In other words, the system as installed failed to properly work, and, in order to make it work, it became necessary to tear out and rearrange the piping, change the position of some of the radiators, and also to supply some additional radiation. When this was done, the heating plant worked properly. The neces-

sary expense of making these changes the defendants sought to counterclaim against the plaintiffs. The defects complained of went to the system or arrangement of the piping and of the radiation, and not to the mere mechanical execution of the work.

The plaintiffs contended that they supplied everything they contracted to supply, and there was no express warranty that the system installed would heat, and that the law would not infer any implied warranty or guaranty that it would work, and therefore the counterclaim could not be upheld.

On the other hand, the defendants contended that they were not familiar with what was required to properly heat the house in question, and left those matters entirely to the knowledge and judgment of the plaintiff, not presuming to say or dictate as to how the result should be accomplished; that there was not only an express warranty of good workmanship which covered the defects complained of, but, if the warranty was not broad enough to cover defects as to the system, the law would imply such a warranty.

It was held that the agreement in the plaintiff's letter that the work would be done "in a workmanlike manner" covered not only the installation and construction of the plant, but also the method or system used to accomplish the desired result. Assuming, however, that this was not the case, it was held that the law would import into the contract an implied agreement that the system of heating installed would be proper and suitable for the purposes for which it was designed, namely, the proper heating of the house. This was not the case of a sale of specific articles simply, but a contract for the doing of certain work, to accomplish certain results. If, in this case, specifications had been furnished, and the plaintiff had simply agreed to carry out the specifications furnished, then clearly he could not have been held responsible for a failure of the system to properly work. But no specifications were furnished, and the manner and method of heating the house were left entirely to the plaintiff.

But by the contract the plaintiff only agreed to supply "radiation" to the amount of 325 sq. ft., and some 100 more sq. ft. of radiation were necessary. As to this, the contract was specific and definite, and it was held that there could be no charge made against the plaintiff for the additional radiation. The cost of that was therefore eliminated from the defendants' counterclaim. As to the necessary cost of the other changes required to heat the house, the defendants' counterclaim was held proven. The plaintiff was held entitled to a lien on the premises of $127.33, less $60 allowed upon the defendants' counterclaim. As each party had prevailed in part, no costs were allowed to either party. —Miller vs. Winters, 144 N. Y. Supp. 351.

Passing of Title to Heating Plans—Materials Not Attached to Structure.

The owners of a building contracted with certain general contractors, M. Bros., for certain additions and alterations, and M. Bros. contracted with the defendant that he should do the plumbing and heating work. The material was delivered and afterwards removed by the defendant. The owners sued them for conversion. The materials were never attached to the structure. In the State of New York it is held that one who contracts to perform work on a building and to furnish materials to be used in the performance thereof, does not, in the absence of a special agreement, part with the title to such materials until they are actually incorporated into or attached to the building. If properly pleaded the defendants would have been entitled to a directed verdict. But, having failed to deny the plaintiffs' allegation that M. Bros. contracted with the defendants to furnish the plumbing and heating fixtures necessary for the alteration and improvement of a house and to install the same, the court assumed that upon delivery of the fixtures in question to M. Bros. they became the property of that firm. The question thus was whether there was anything to show that the plaintiffs, prior to the alleged conversion, had acquired title thereto, or such possessory rights as would enable them to maintain this action. The contract provided for monthly payments of 85 per cent. of the value of the "work furnished" by subcontractors and the actual value of the "work furnished" by the contractor, and that the owners might, under certain conditions, terminate the employment of the contractors and enter on the premises and take possession, for the purpose of completing the work, of all materials, tools and appliances thereon. It was held that furnishing materials to be used in completing the plumbing and heating contract was not "furnishing work" within the 85 per cent. clause, and, there being no evidence that the architects had certified that the conditions on which the employment might be terminated had occurred, the plaintiffs were not shown to have acquired title to the materials so furnished not to have been in possession at the time the defendant removed them so as to entitle the plaintiffs

to recover therefor in conversion.—Lord vs. Woolley, 144 N. Y. Supp. 385.

ELBERT HUBBARD ON TRADE PAPERS.

Trade Papers—Their Purpose and Individuality.

(*This series of articles commenced in the September, 1913, issue.*)

Individuality implies intelligence, purpose, power, intent—something unique, peculiar, different.

The trade paper has individuality and its editor is of necessity a personage, not merely a person.

The intent of the trade journal is not to astonish, divert, or to match a mug of beer and a box of cigarettes.

The trade paper is published for a purpose, and that purpose is to give assistance to men in a certain trade.

It makes its subscribers stronger and more competent; gives them specific information; puts them in touch with the latest changes in their particular line of work; mirrors every improvement to the intent that the dealer, the artisan, the artist, the craftsman, shall not be handicapped by lack of information as to what others are doing and saying.

And so the editor of a trade paper is the friend, the big brother, the partner, of every man who makes his bread and butter in this particular trade.

He must confer a benefit. He must get a tangible result; and so you will find that editors of trade papers are not only able writers, but they are skilled men who know the science of business.

We used to hear men say: "Oh, I am not in business for my health"; but the man who is not in business for his health hasn't much health or much business. Yet the fact remains that a truly prosperous man is always a healthy man.

Happiness and evolving prosperity are synonymous. One only gets the creeps when the tide turns against him; but instead of resorting to booze or dope the man worth while comes up stronger, hits harder and reflects the spirit which won't die.

The man who lays down invites defeat because he loses his courage and is fighting a lonely individual battle, with what Henry Ward Beecher called "the cussedness of inanimate things."

So the moral is this: Be open for knowledge, absorb it, and you will close your portals to defeat or failure. Stand by the editor of your trade paper. Write to him when he is rightfully standing by you; when you find a good thing in his magazine tell him he is a lallapaloosa and your heart is with him. You will feel better, and so will he. There is nothing in the world quite so inspiring as a recognition of good work.

No man knows everything. If he thinks he does he is making a mistake; if he says so he proves he doesn't.

We need to be continually verifying our opinions, substantiating our statements. We need some vital information on subjects outside our ken.

And such a source of strength and value we find in the trade journal.

The paper or book that tells us what we know or what we think—or what we think we think we know—is the one we like.

Successful writing is not altogether the expression of a new idea, but the forceful presentation of an old one.

The trade journal does both. It serves up known truths appetizingly and also gives us new food for thought.

That needs psychology, an analytical mind, a thorough knowledge of the subject and of humans.

It must be a human document—a living thought.

And this presumes an individuality behind it—a pulse, a heart, a sympathy, an understanding of you and your needs.

The trade journal possesses these qualifications.

It enjoys an individuality which no other publication does.

It has behind it men possessed of conscientiousness, character and will.

Rational thinking fills its pages and it is permeated with moral ideas.

The trade journal is a storehouse of knowledge, a mine of truths, an ocean of facts.

The trade journal can never be called a parasite.

It is published not for light entertainment, but for the definite and valuable knowledge which it imparts to the reader.

It meets the needs and requirements of every subscriber, saving him both time and money.

From it he culls ideas and ideals, broadens his vision, extends his horizon, widens his views.

There is no field of industrial and commercial activity that is not touched and vitalized by the trade journal.

From cover to cover the trade journal exhibits a hearty interest in its readers, and their business.

It gives inspiration, encouragement and advice.

The trade journal stands for evolution, education, uplift and self respect.

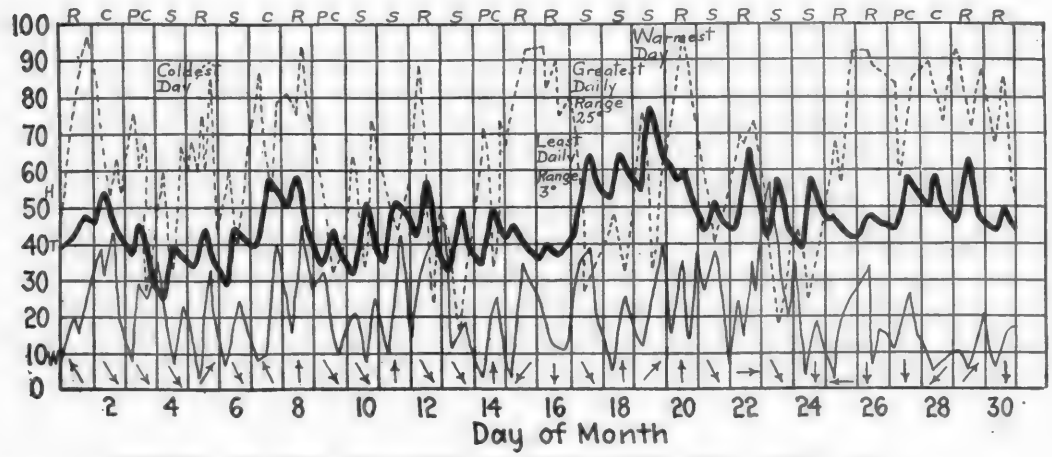
It gives directness to thought, purpose to endeavor.

It means service and utility, influence and power. It means Brotherhood.

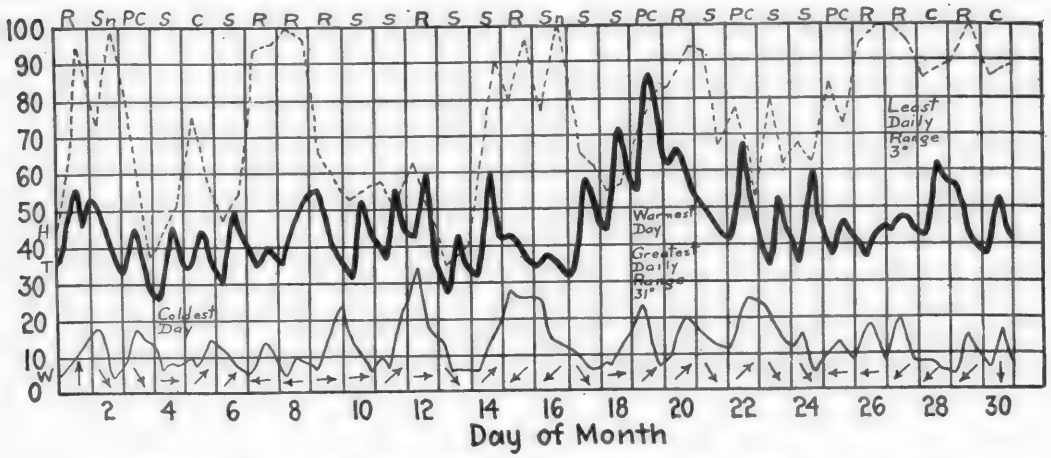
(*Copyright*, 1914, *Kovnat.*)

The Weather for April, 1914

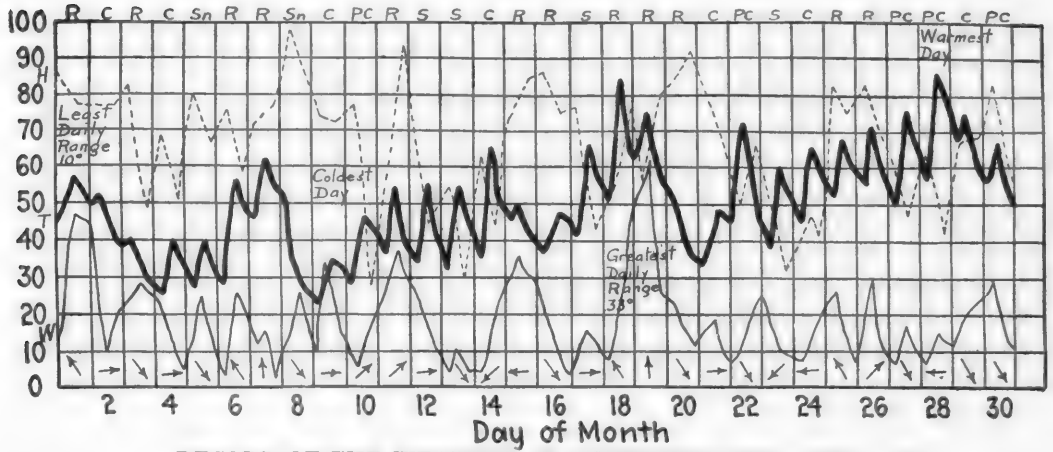
	New York	Boston	Pittsburg	Chicago	St. Louis
Highest temperature, degrees F.	78	87	86	81	82
Date of highest temperature	19	19	28	21	16
Lowest temperature, degrees F.	26	27	23	20	26
Date of lowest temperature	4	4	9	8	9
Greatest daily range, degrees F.	25	31	33	47	38
Date of greatest daily range	17	19	18	21	21
Least daily range, degrees F.	3	3	10	5	7
Date of least daily range	16	27	1	30	1
Mean temperature for month, degrees F.	46.6	45	49	48.3	56.4
Normal mean temperature for month, degs. F.	48	45.3	51	45.9	56.1
Total rainfall, inches	2.67	5.87	3.98	1.07	1.92
Total snowfall, inches	....	2	3.5	0.1	....
Normal precipitation this month, inches	3.3	3.55	2.9	2.88	3.52
Total wind movement, miles	13,957	8,622	8,996	10,046	9,918
Average hourly wind velocity, miles	19.4	12	12.5	14	13.8
Prevailing direction of wind	N.W.	N.W.	N.W.	S.W.	N.W.
Number of clear days	7	12	5	10	6
Number of partly cloudy days	7	5	7	9	16
Number of cloudy days	16	13	18	11	8
Number of days on which rain fell	15	12	14	9	7
Number of days on which snow fell	....	2	2	1	....
Snow on ground at end of month, inches	....	....	....	....	....



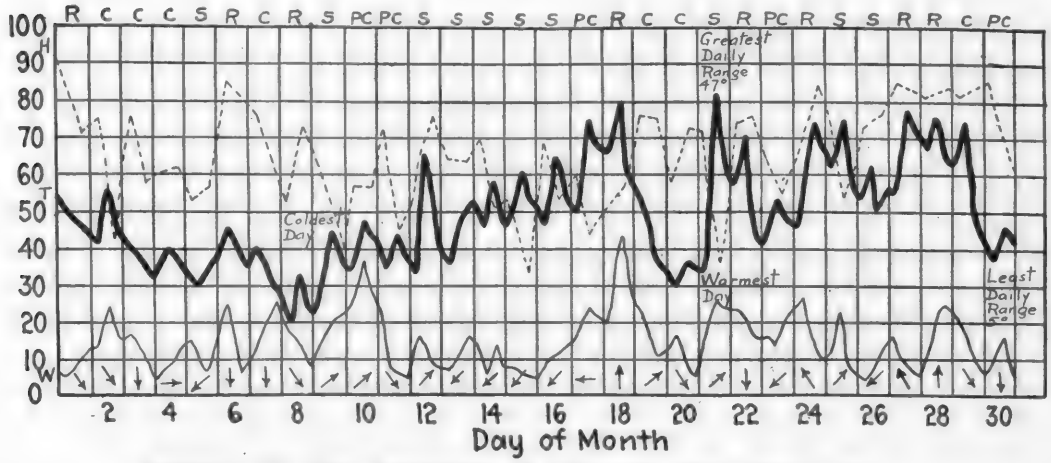
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1914.



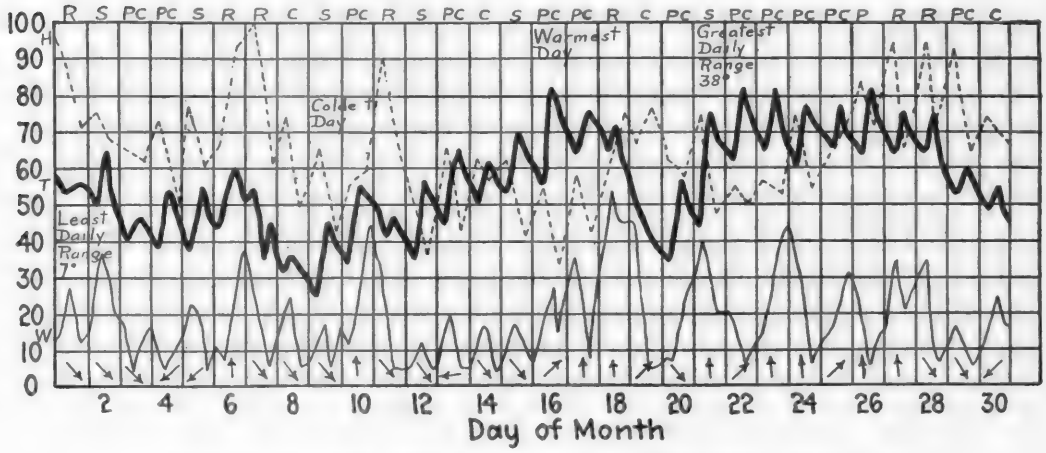
RECORD OF THE WEATHER IN BOSTON FOR APRIL, 1914.



RECORD OF THE WEATHER IN PITTSBURGH FOR APRIL, 1914.



RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1914.



RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Dinner for New York Heating Trade.

The annual dinner of the New York heating trade, which was instituted two years ago by the New York Chapter of The American Society of Heating and Ventilating Engineers, was held May 18 at Reisenweber's. Over 100 heating engineers, contractors and manufacturers' representatives were present. During the dinner professional story-tellers entertained the company, their remarks being interspersed with orchestral music.

While no formal speeches were arranged, Walter S. Timmis, president of the New York Chapter, took advantage of the occasion to express his views of the needs of the chapter and society, and of the profession in general. He said that the profession should work for a higher quality of engineering work which, from a scientific standpoint, was not taken as seriously as it should be. There is also a reluctance on the part of men who have much to give to impart their information to the society or to others. Mr. Timmis pleaded for more publicity in the daily and technical press, and he thought that with such publicity a demand would arise for the installation of more efficient apparatus. If, for instance, it were recognized more widely that a system of heat control is necessary, there would be fewer complaints of overheated houses which are now heard on all sides. Others who spoke were Vice-President W. H. Driscoll, Secretary Wallace F. Goodnow and Frank K. Chew. Mr. Chew emphasized the fact that many a man who is familiar with features in his own work has information that would be of great interest and value to another man in the same general line, and he urged a wider exchange of ideas in the form of papers and discussions before the society.

The arrangements as successfully carried out were made by a committee, consisting of Frederick K. Davis, chairman; George G. Schmidt, G. W. Knight, W. H. Driscoll and J. I. Lyle.

Illinois Chapter Takes Up Chimney Drafts.

"Smoke and Chimneys" was the subject for the May meeting of the Illinois Chapter and was discussed by several members of the Chicago Smoke Commission, including Messrs. Monnett, Chambers and Misostow. The committee in charge of the meeting were Charles F. Newport, chairman; R. M. Stackhouse and J. P. Dugger. Mr. Monnett told of the work of the Chicago Smoke Commission since its inception in 1907 and made the suggestion that the work of the commission might well be extended to include the proper proportioning of chimneys for apartments and similar buildings. Mr. Chambers told of the "fuel agreement" in operation in Chicago which allows the use of semi-bituminous coal in such buildings where smoke-consuming boilers are operated.

The chapter voted to bear the expense of installing a small Carrier air washer for testing purposes in the city hall for the joint use of the Chicago Ventilation Commission and the chapter's committee on air washers. A nominating committee was named, consiting of Messrs. Stannard, Small and Davis.

The Home of the Dunham Radiator Trap.

While Iowa is the natural home of large corn fields and prosperous farmers, it is also the home of some five thousand thriving factories. One of these, that of the C. A. Dunham Company, of Marshalltown, Iowa, while perhaps not the largest, boasts of as fine equipment as can be found in any factory in the country. This company manufactures the well-known line of Dunham steam specialties, foremost of which is the Dunham radiator trap.

The entire plant of the Dunham company, as shown by the accompanying illustration, is absolutely fireproof. When the buildings were designed, one of the thoughts foremost in the minds of the owners was the comfort and

C. A. DUNHAM.

convenience of the employees. The buildings include office building, main factory, warehouse, power plant, and coal storage building.

In the office building are located the administrative department, sales department, finance and accounting department, engineering department, and research department.

C. A. Dunham, president of the company, heads the administrative department. It is here that new company policies are evolved and formulated.

The sales department, which has charge of disposing of the various products of the company, is managed by J. W. Hook. This department has jurisdiction over the twenty-seven branch offices of the Dunham company,

PLANT OF THE C. A. DUNHAM COMPANY AT MARSHALLTOWN, IA.

located in all the principal cities of the United States.

All collection of accounts, purchase of new material, cost keeping, etc., are handled by the finance and accounting department, in charge of E. A. Francis.

The engineering department of the C. A. Dunham Company, which is a part of the sales department, is especially well equipped. F. D. B. Ingalls, chief heating and ventilating engineer, has had a wide and varied experience in this class of work. His assistant is a graduate of the large engineering school at Christiana, Norway. The young engineers under him are, for the most part, graduates of various technical schools of this country, so that the class of work turned out by this department is maintained at a high standard.

In the research department, R. N. Coats has charge of the testing of new products, the application of new ideas, and the various improvements which from time to time are added to the present line.

One cannot help but be impressed when entering the main factory building of the Dunham company. The entire equipment is quite up-to-date, and is so constructed and arranged that a high degree of manufacturing efficiency can be attained. Everything about the building is operated by electricity supplied by the power plant, which is located a short distance to the rear of the factory.

The factory superintendent, F. E. Schmidt, has his office in this building. It is located midway between the first and second floors and in such a position that from his desk he is able to watch operations on both floors.

The warehouse, which is the newest building about the plant, contains the shipping department, together with storerooms for manufactured products. The basement of this building is used for storing of all raw material.

An air of prosperity prevails throughout the entire plant. This is not to be wondered at when it is remembered that not a great many years ago the Dunham company began operations in the basement of a store building in Marshalltown, and with a force of two men. Business proved to be very good, and it was not long before the company was obliged to move into larger quarters and to employ more men. The steady increase of orders year after year finally necessitated the erection of the present group of buildings.

NEW DEVICES

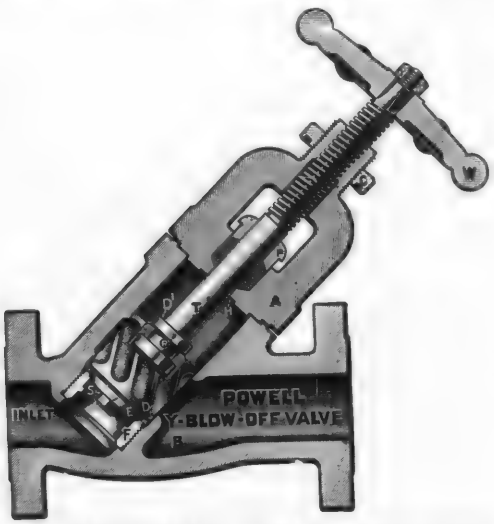
Interesting Type of Blow-Off Valve.

Of the various services to which valves are adapted, there is none in which the requirements are more severe than for a blow-off valve. Owing to the strain which such valves undergo, they frequently break down or leak badly after a few months' use. The Powell "Y" blow-off valve, shown in the accompanying illustration, has been designed to meet the most exacting requirements in this connection and is offered to the trade by the Wm. Powell Co., Cincinnati, O.

"B" is the body or shell. The yoke top "A" is secured to the body by studs. The packing is secured and regulated by the Powell patent pusher gland "P," which is operated by the outside screw nut "C" above the bridge of the yoke "A." This construction enables the engineer to adjust the pressure at any time with an ordinary monkey-wrench, without having to manipulate the bolt and nut style. Engineers will appreciate this convenience, especially when it is required to renew the packing, as there is no liability of skinning one's knuckles when doing so. The faces "D" and "H" fitting tight, permit the valve to be repacked under pressure when wide open. The plunger "D" is of brass, milled to receive the collar on stem "T." Spiral grooves are cast on the outer face, which, receiving the pressure from the steam as the valve is open, cause it to revolve as it nears the seat when closing. This gives the disc a grinding motion and tends to keep both disc and seat clean of scale and sediment. The seat ring "F" has been dropped down lower to better protect it from the cutting effect of the rushing steam as the valve is opened. To this plunger is attached the Powellium white bronze reversible and regrinding disc "E," secured to stem by disc nut

"S." The disc face and seat-bearing are constructed with such an angle that it is impossible for any sediment or scale to lodge between the same either while blowing off or closing down the disc, and the metal of which they are constructed insures a long life to the valve.

They are made in 2 in. and 2½ in. sizes, either screw ends or flanged. To regrind, it is



POWELL EXTRA HEAVY BLOW-OFF VALVE.

only necessary to stick a plug or nail through the hole "R" in the plunger; this locks the disc, then rotate back and forth with a little fine brick dust or sand on the bearing. The seat ring "F" is of Powellium white steam bronze and has two faces. When one is worn, it may be removed and reversed by means of the lugs cast in the throat of the ring. The disc "E" is not only regrinding and reversible, but is also renewable. It is made from "Powellium," a white bronze, which, it is stated, in point of service and durability, will outlast any other known disc metal and is guaranteed to stand 2,000 deg. F. of heat. Each valve is tested to 250 lbs. hydraulic pressure.

New Small-Size Johnson Thermostat.

What the manufacturers describe as two important developments in the art of temperature regulation have recently been placed on the market by the Johnson Service Co., Milwaukee, Wis. One is a very small thermostat and the other, a radiator valve with a metal diaphragm. Both of these devices have been designed to meet the demand of the public, first, because of the desire of the architects that the thermostat, although necessary, should be inconspicuous so as not to interfere with the artistic decoration of the room; and, second, because modern heating systems frequently require that radiator valves be placed in very warm places and rubber diaphragms are liable to vulcanize under such conditions.

This small thermostat is not quite as large as one-button push plate, and is remarkable for its handsome appearance as well as for its carefully-made mechanism. The Johnson principle has been maintained, but in rearranging the parts of the thermostat, it has been possible to produce several improvements over the former style of thermostat. The parts are fewer in number, more accessible, making the new type a simple and easily understood device. It will no doubt be welcomed by those who are looking for the latest advances in this line.

Automatic Control of Steam for Extinguishing Fires.

The adaptability of high pressure steam for purposes of fire extinguishing has long been recognized, but heretofore its use has been entirely subject to hand control of the steam valve. Considerable interest, therefore, attends the development of a system of fire prevention which includes both a fire detector and an automatic release for the steam valve. The principal device used in this system, which is the invention of Burton P. Hall, New York, is known as the Nyasco automatic release valve and has recently been placed on the market by the New York Automatic Sprinkler Co., 206 Centre St., New York. As will be seen from the illustration, its characteristic feature is a tripping device which is held in place by air pressure. When this pressure is released, the tripping device falls apart and opens the valve.

As installed, the automatic releasing valve is located at any convenient point on the steam line which extends into the building, with branches and outlets, after the usual manner of sprinkler piping, having openings at frequent intervals.

Fusible plugs are located at the various points to be protected and are connected to an independent closed system of small piping maintained under a light air pressure. The fusing of one or more plugs releases the air in the closed system, thereby opening the releasing valve and introducing the steam to the distributing system, at the same time sounding an alarm.

The feature is emphasized that no auxiliary apparatus is required other than a small hand air pump. The air pressure to be maintained need not exceed 20 lbs. per square inch under any conditions, as the air pressure bears no relation to the steam pressure.

In a recent test of the device made in a small wooden building constructed for the purpose in Greenpoint, Long Island, which

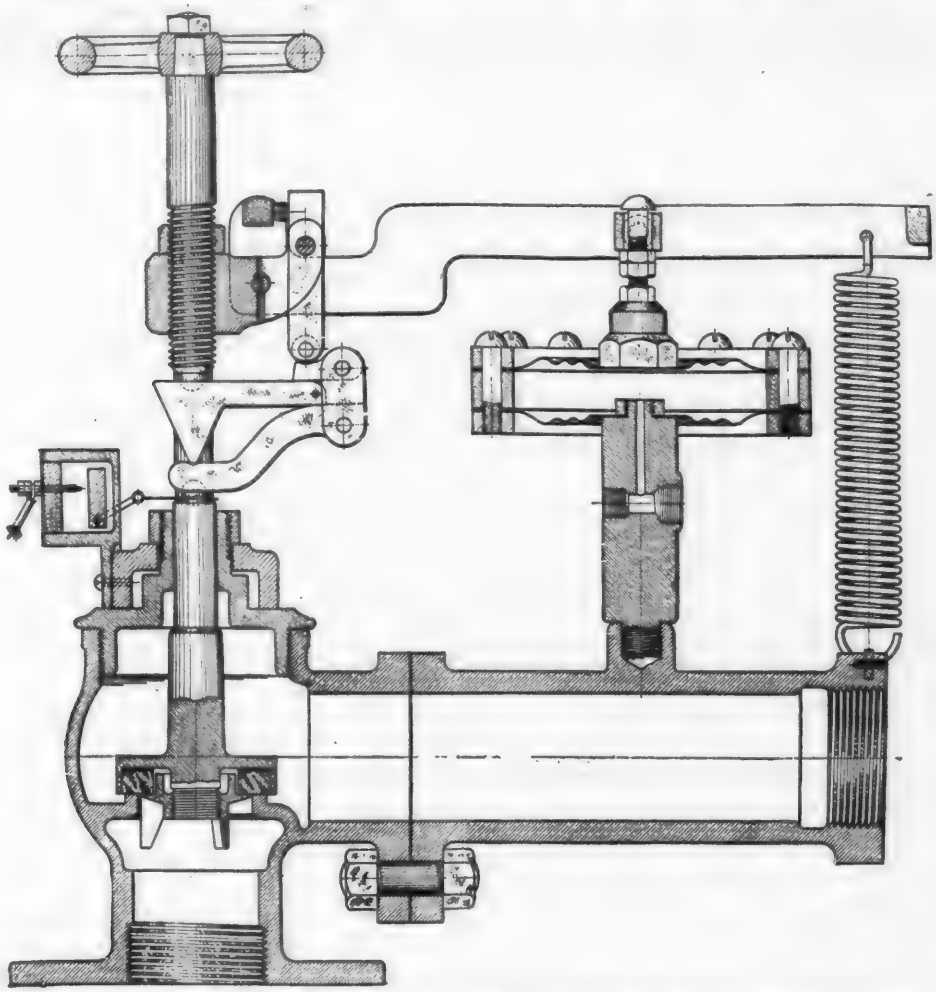
was attended by Fire Chief John Kenlon, of the New York City Fire Department, together with Deputy Commisioners Weeks and Ayrmer, Chief Hammett of the Fire Prevention Bureau, and C. T. Coley, engineer in charge of the new Equitable office building, two open pans, 24 in. x 36 in., containing gasoline were fired and the door of the hut closed. A glass window in the door enabled the spectators to see the blaze which practically filled the interior. In this test the fusible plug melted in 25 seconds from the time of igniting the gasoline, tripping the releasing valve. A cloud of steam at 100 lbs. pressure immediately filled the interior and the fire was pronounced out in 55 seconds. Another test was made, the gasoline pans being set on the floor of the hut and touching the side walls. In this test the flames burst through the crevices between the boards, but, as before, the fusible plugs melted, admitting the steam, and the fire was out in 1 minute and 15 seconds.

The Nyasco automatic releasing valve has already received the endorsement of the New York Bureau of Fire Prevention and has also been approved by the Board of Fire Underwriters. In addition to its adaptability for use generally, it is said to be especially applicable in connection with fire detection and extinguishing in cargo holds, tank ships, tank barges, etc.

The officers of the New York Automatic Sprinkler Company are: President, Burton P. Hall; secretary-treasurer, George E. Hall. The company's sales manager is C. B. Bradley.

New Style of Steam Heater.

A new type of steam heater, known as the Posas steam heating plate system, has recently been introduced in Europe and has



AUTOMATIC RELEASE VALVE FOR USE IN EXTINGUISHING FIRES WITH STEAM.

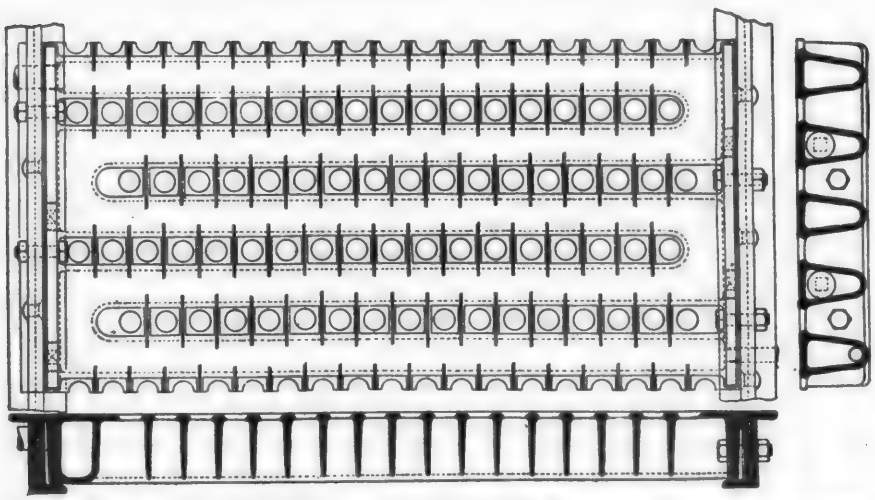
been patented in the United States. It is designed for use in place of coils, radiators, boiler tubes and plain steam plates. In the design of the heater, 10 sq. ft. of the heater surface is equivalent to over 45 sq. ft. of coil surface. It may be used singly or in batteries.

The Posas heater is made with 180 air holes per 10¾ sq. ft., through which an intensive, as well as an evenly-divided, current of air is passed. The peculiar construction of the Posas heater gives a total air space through the holes amounting to 232.5 sq. in. to every 10¾ sq. ft. On account of the construction of cross-ribs between the separate steam channels, every 3 sq. in. of the heater has its own small air heater or heating chamber, with its own individual air entrance and air outlet, which, it is stated, gives the heater the highest attainable heating effect.

Among the advantages mentioned for this type of apparatus are a saving in cost of installation, an equally divided heating effect and, when used for drying purposes, a high efficiency, both as to quality, quantity and time.

The inventor of the Posas heater is Silvio A. Schewzik, of Vienna, Germany, who is planning to market the heater in the United States. His representative at present is E. Carl Foerster, Hawthorne, N. J.

POSAS STEAM HEATING PLATE.



CONSTRUCTION OF POSAS STEAM HEATER, SHOWING ARRANGEMENT OF AIR HOLES.

GASOLINE STORAGE OUTFITS, welded gasoline tanks and garage air tanks are illustrated and described in a new catalogue published by Wm. B. Scaife & Sons Co., Pittsburgh, Pa. The different outfits are shown and described in detail, with the necessary tables of data, and illustrations are also included of the correct methods of placing and con-

necting both long distance and direct lift storage tanks. Size 6x9 in. (standard). Pp. 12.

THE BOOK OF SPARKS, detailing the features of the Sparks automatic vacuum and system of steam heating, is the title of a handsome catalogue, published by the Automatic Vacuum Pump Co., Chicago. The text includes an interesting review of the development of the heating industry, showing the advances made by the adoption of the principle of vacuum heating. Beside showing the Sparks apparatus, the illustrations include well-drawn complete typical installations, in addition to details showing method of making connections of the system to coils and radiators of various types. Nearly half of the catalogue is taken up with views of some of the residences, apartment buildings and hospitals in which the Sparks system is in successful use. Size 6x9 in. (standard). Pp. 64. A specification bulletin for the Sparks automatic vacuum pump and system, which accompanies the catalogue, covers the various points of installation in detail. Size 6x9 in. (standard). Pp. 19, the specifications themselves occupying three pages.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

June 10-13, 1914.—Twenty-sixth annual convention of the National Association of Master Steam and Hot Water Fitters at Atlantic City, N. J. Headquarers at the St. Charles Hotel.

June 16-19, 1914.—Thirty-second annual convention of the National Association of Master Plumbers at Atlantic City, N. J. Headquarters at the Hotel Rudolf.

June 16-19, 1914.—Spring meeing of The American Society of Mechanical Engineers, at Minneapolis and St. Paul, Minn.

July 9-11, 1914.—Summer meeting of The American Society of Heating and Ventilating Engineers, at Cleveland, O. Headquarters at the Hotel Statler.

Miscellaneous Notes.

Missoula, Mont.—The ventilating plant that has been installed at the east end of the Mullan tunnel of the Northern Pacific Railroad to drive fresh air into the bore was tested recently when a number of officials inspected the plant. The apparatus produced a current of air which was equivalent to a 60-mile gale, driving the smoke ahead of the engines. The manufactured gale, however, can be regulated to almost any velocity desired. The system will make the Mullan tunnel absolutely safe for trainmen and passengers who go through it. It is said to be the second plant of its kind in the country.

Fostoria, O.—The board of education will order an expenditure of $15,000 on the installation of new heating systems in the public schools. The systems will be designed to use coal instead of gas for fuel.

Brookings, S. D.—Brookings will make improvements in its municipal power and heating plant to the extent of about $10,000.

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Chicago, Ill.—Ventilating systems have been installed or are in process of construction in 292 Chicago theatres. There are still 282 theatres in Chicago without such equipment.

Des Moines, Ia.—A special committee of Des Moines business men has been appointed to investigate the central heating business in cities where it is now in use for the purpose of preparing a report to the Chamber of Commerce on the advisability of granting a franchise for a central heating plant in the business district of Des Moines to the McKinley syndicate. The committee is composed of W. L. Hinds, of the Merchants' Transfer and Storage Co.; Mark Johnson, of the Mark Johnson Co.; R. R. Rollins, of the Shops Building; F. J. Camp, of the Brown-Camp Hardware Co.; James Wallace, of Wallace and Linnane, heating contractors; James P. Hewitt, of the Randolph Hotel, and John A. Elliott, of the Commercial Savings Bank.

Dayton, O.—On May 1 the city entered into a contract with the Dayton Light & Power Co., by which the latter will supply all steam for heating the city building. A saving of $500 has been estimated per year in buying heat instead of producing it.

Detroit, Mich.—A city ordinance on ventilation, passed in Detroit in 1881 and apparently long forgotten, has been brought forward by a number of public-spirited citizens in Detroit to secure better air conditions in the factories and similar places in that city. The full text of the ordinance is as follows:

Chapter 125, Detroit City Ordinance. (Approved September 7, 1881.)

Section 1. No person, persons, company or corporation shall employ, put or keep at work in any room, building or enclosure in the city of Detroit a greater number of persons than shall be warranted by the laws of health or approved by the board of health of said city. Every manufactory, workshop, salesroom, warehouse and other place of like character where two or more persons are employed shall have suitable ventilating appliances, sufficient for the carrying off of all foul or impure air, and for the reduction of the air therein to the standard of fresh air, and every place shall have therein in each and every work room at least five hundred cubic of air space for every person therein employed.

Section 6. The board of health shall visit and inspect, or cause to be visited and inspected, by the health officer, all places in the city used or occupied for the purposes

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above mentioned, at least once in every two months, to see that the requirements of this ordinance are complied with and for the purpose of making complaint for any violation thereof.

Section 9. Any corporation, manufacturer, employer, agent or other person refusing admission to his or her factory, workshop, store or other place of employment or service to the board of health or health officer, or refusing or neglecting to comply with the provisions of this ordinance, shall be fined not exceeding two hundred dollars; and in the imposition thereof the court may further sentence that, in default of the payment of the fine imposed, the offender be imprisoned in the Detroit House of Correction for any period of time not exceeding six months.

Fremont, Neb.—A municipal steam heating plant to utilize the wasted steam at the city water and light station is being discussed in Fremont and a committee of the city council is now considering the proposition. This committee consists of John Martin, Henry Jess and F. M. Thompson, who will act in conference with Light and Water Commissioner Wright. Mr. Martin states that he had the promises of a number of business men of the city to use the steam heat from a central plant for their buildings, provided such a plant were installed.

North Yakima, Wash.—The Central Heating Co., which has an extensive system of steam heating from a central plant, is considering plans for the erection of its own steam-producing plant in lieu of a new contract with the Artificial Ice & Cold Storage Co., which has furnished steam to the heating company for the last five years. The matter is in the hands of the company's board of trustees, with power to act and with authority to take up the present $20,000 bond issue of the company and make a new issue of $45,000 in case it decides to build.

National Warm Air Heating and Ventilating Association has arranged for a convention of the warm air furnace industry in Detroit, June 23.

Central Supply Association will meet in Detroit, Mich., June 17. Following the custom of recent meetings an address on some subject of importance to the association will be delivered by a speaker of national prominence.

Cleveland Master Steam and Hot Water Fitters' Association has been organized in Cleveland, O., with the following officers: President, Albin Seidel, Becker-Seidel Co.; vice-president, D. A. Stewart; secretary, W. B. Van Sickle; treasurer, A. E. Welker, Price-Welker Co. Executive committee: C. H. Warner, C. H. Warner Co.; R. J. Chappell, Chappell-Warner Co.; William Chafer, Chafer Co.; Walter Klie, Smith & Oby Co., and D. A. Stewart.

Eastern Supply Association met in Atlantic City, June 10.

Schenectady, N. Y.—An official to be known as a steam fitting and plumbing inspector of work in public schools has been added to the staff of that city by the Board of Estimate and Apportionment.

Tacoma, Wash.—Application for a cen-

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excel because they are well designed, and made of a superior grade of new steam metal. The body, trimmings and all parts have strength and stability. They are made for satisfactory service, and guaranteed to give it.

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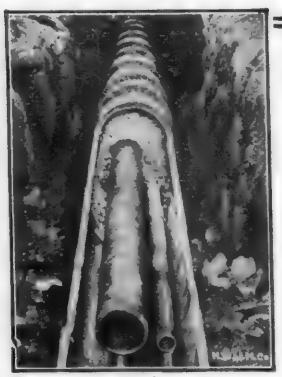
New York 50 Church St. **The Industrial Instrument Co., Foxboro, Mass.** **Chicago** Monadnock Bldg.

tral hot water heating franchise has been filed with the city clerk by the Tacoma Heating Co. The company has a capital of $300,000.

Dayton, O.—The Engineers' Club of Dayton has recently been organized and has opened a clubhouse at Second and Madison streets in that city. The opening exercises were held May 14. The membership is divided into active, associate and junior members, with annual dues of $25,000 for the first two classes, and $10.00 for the junior class. The initiation fee is placed at $5.00 for the active and associate members and there is no initiation fee for juniors. The club will establish affiliations with all of the prominent engineering clubs in the country with a view of permitting interchange of club room and library privileges.

National Pipe and Supplies Association, at its recent meeting in New York, elected the followng officers for the ensuing year: President, W. M. Pattison, Cleveland, O.; first vice-president, A. L. Scott, San Francisco, Cal.; second vice-president, Alexander B. Pierce, St. Louis, Mo.; treasurer, C. G. Cornell, Jr., New York; secretary, George G. MacIlvaine, 908 Oliver Building, Pittsburgh, Pa. Executive committee: Wm. Q. Wales, Boston; George V. Denny, Savannah, Ga.; A. A. Merkel, Cincinnati; J. B. Rahm, Omaha; Alvin M. Smith, Richmond, Va.; Frank A. Bucknam, New York; George B. Limbert, Chicago, and L. C. Huesmann, Indianapolis, Ind. One of the principal addresses at the meeting was made by Felix H. Levy on "Trade Associations, With Particular Reference to the Sherman Anti-Trust Law," in which he called attention to the limits to which trade associations can legitimately go in regulating trade conditions. Points brought out in the committee and other reports were that the average cost of doing business is 16 74-100 per cent., and that the cost of doing business is highest in New England. The jobber of wrought pipe was considered a necessity on account of the large amount of emergency business. The jobber also feels that he is entitled to protection on carload business as the manufacturer depends upon him for the distribution of less than carload lots. An increase in the rate of discounts on bills, making it 10 per cent. instead of 2 per cent., had resulted in a large increase in the number of collections and in many cases had obviated the necessity of a collector. An attendance of 300 delegates was registered. Buffalo was selected as the next meeting place.



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The Detroit Packless Radiator Valve was developed to meet the demand for a **better** radiator valve. It has been proved to be better in every way.

Ordinary valves with stuffing boxes are bound, sooner or later, to leak around the stem. It is uncommon to find a building with valves of the packed type where leaking water has not done some damage.

Stained and discolored walls and ceilings, loose plaster, spoiled floors, rugs, furniture and decorations—these are some of the most common evidences of the use of the ordinary packed valves.

Detroit Packless Valves are sure protection against such troubles.

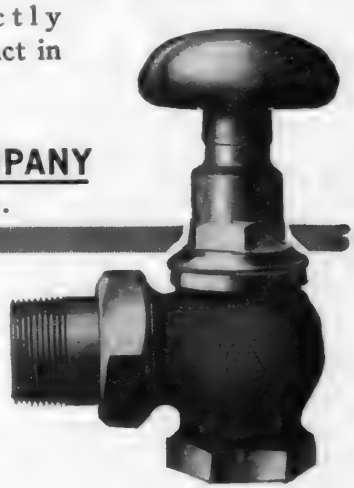
They give freedom from annoyance to owner and tenant and eliminate the expense and inconvenience of having radiator valves repacked at frequent intervals.

Detroit Packless Valves are absolutely tight and they always stay tight. They will not leak under any circumstances.

The valve is simple inside and out. It is beautifully proportioned and has a pleasing and substantial appearance made to accord and harmonize with handsome surroundings in high-class residences, apartment houses, hotels and office buildings.

The mahogany handle cannot collect dust and its shape and size insure a perfect grip without the hand coming into contact with any hot metal.

Detroit Packless Valves meet every requirement for a **good** valve and for a **handsome** valve. They are a strictly quality product in every way.



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DETROIT, U.S.A.

Form of Specification
"All radiator valves to be genuine Detroit Packless, manufactured by the Detroit Lubricator Company."

Manufacturers' Notes.

American Radiator Company, Chicago, Ill., has declared a quarterly dividend of 2½ per cent. on its common stock, payable June 30 to holders of record June 22. Heretofore quarterly dividends of 2 per cent. have been paid.

Wisconsin Plumbing & Heating Supply Co., Milwaukee, Wis., has purchased ground on Reed Street, between National Avenue and Walker Street, on which it intends to build a new factory building. The site has a frontage of 102 ft.

Williamson Heater Company, Cincinnati, O., is the changed name of the Peck-Williamson Heating and Ventilating Co.

Pressed Radiator Co., Pittsburgh, Pa., anounces the appointment of Homer R. Lind as manager of its Chicago branch. Mr. Lind was formerly Western sales manager of the heating department of the General Fire Extinguisher Co.

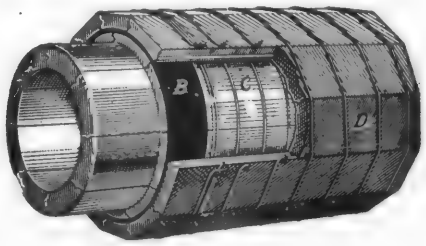
Joseph Dixon Crucible Co., Jersey City, has filed a certificate with the Secretary of State of New Jersey, increasing its authorized capital stock from $1,000,000 to $2,000,000. At the company's recent annual meeting the retiring board of directors was unanimously re-elected. The present officers are: President, George T. Smith; vice-president, George E. Long; treasurer, J. H. Schermerhorn; secretary, Harry Dailey; assistant treasurer and assistant secretary, Albert Norris.

United States Radiator Corporation, Detroit, Mich., is planning a large addition to its plant in Detroit for manufacturing boilers and radiators.

Pierce, Butler & Pierce Mfg. Co., Syracuse, and the Kellogg-Mackay Co., Chicago, whose reorganization was announced last month, will be under the active management of Clarence V. Kellogg, of Chicago, and J. T. Duryea, of New York.

H. W. Johns-Manville Co., through its Seattle, Wash., branch, announces a recent order for supplying cork sheets for the Mainland Ice & Cold Storage Company's new plant at Vancouver, B. C. These sheets, which are known as J-M pure cork sheets, are made by compressing pieces of cork in moulds at a temperature of 500° F. At this temperature the natural gum of the cork is liberated, forming a solid block which will not crumble, rot or absorb moisture.

Buffalo Foundry & Machine Co., Buffalo, N. Y., manufacturers of vacuum dryers, evaporators, etc., announces that it has terminated the arrangement whereby H. E. Jacoby has been representing them in New York City and vicinity, and that the company is now handling direct all inquir-



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B—Asphaltum Packing.
C—Dead Air Space.
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CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

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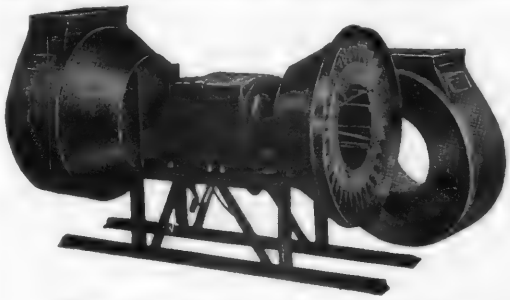

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Manufactured Exclusively by

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The above cut shows one of the Hackney Noiseless Blowers, which when used in connection with their system of ventilation, fully covered by patents, is guaranteed to be the only system sold or made that will bring in the necessary amount of fresh air according to what the premises are used for, their area and the number of occupants, keeping them to almost a state of purity, which we are enabled to do, because we remove the same amount of foul air at the same time. All this is done without draughts or chills, causing sickness. You will observe we thus keep the air in perfect balance.

No other system, as you probably are aware, can do this. We can distribute anywhere between three thousand and ten million cubic feet of air per hour.

Our blowers, besides being noiseless, will give more air with less horse power than any other blower of equal dimensions, thus making our system specially suitable for churches, schoolhouses, theatres, etc.

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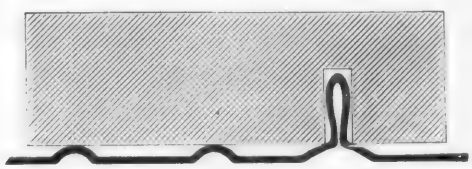

equipment for windows and doors has cured more trouble jobs than any other known apparatus. It standardizes a building in the one part that it is ordinarily weak. It eliminates uncontrolled leakage at windows and doors. Write for detailed information.

CHAMBERLIN METAL WEATHER STRIP CO.

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ies covering vacuum apparatus, castings, patterns and machine work.

J. C. Hornung, Chicago, reports that since the opening of his offices, January 1, 1914, at 111 West Monroe Street, he has been kept busy on examinations and reports in connection with his general consulting business as applied to central station heating and power plants. Mr. Hornung was for many years engaged in the design and construction of Schott systems. He has recently been granted several patents on controlling devices which are now being manufactured and installed.

New Firms and Business Changes.

Erickson & Troost, Swift Current, Sask., Canada, is a new firm organized to design and install steam and hot water heating systems and power piping. H. A. Erickson, one of the members of the firm, was formerly of Cleveland, O.

Lewis & Capron, Chicago, Ill., has been organized by Samuel R. Lewis and Edmund F. Capron, to conduct a designing and contracting business for heating and ventilating apparatus. Mr. Lewis is president of The American Society of Heating and Ventilating Engineers, while Mr. Capron has been associated for many years with the Davis Construction Co. The new firm has taken quarters in the Karpen Building, on Michigan Avenue.

Business Troubles.

Magee Furnace Co., Boston, Mass., has had a petition in bankruptcy filed against it by Walter F. Picket, Melrose; W. M. McGee, Boston, and E. A. McGregor, Dorchester, each with a claim of $5,000 loaned to the company. The company has been in business in Boston 40 years and operated a large manufacturing plant at Chelsea.

New Incorporations.

Mead Gas Heater Co., Passaic, N. J., capital $80,000, to manufacture gas radiators, heaters, etc. Incorporators: J. A. Troast, C. F. H. Johnson and F. W. Gaston, all of Passaic.

Carley Heater Co., Inc., Olean, N. Y., capital $75,000, to conduct a general machine shop and foundry and to manufacture heating goods. Incorporators: F. L. Gleason, W. M. Abrams, Jr., and C. W. Wallis, all of Olean.

W. J. Gemeny Co., Chicago, capital $2,500, to engage in a heating and ventilating and manufacturing business. Incorporators: William J. Gemeny, John T. Booz and Peter J. Johnson.

Badger Heating Co., Milwaukee, Wis., capital $10,000. Incorporators: D. J. Crowley, Oscar E. Sandberg and F. H. Corcoran.

Holton-Abbott Manufacturing Co., Somerville, Mass., capital $50,000, to manufacture heating and plumbing specialties. Incorporators: Edwin C. Holton, South Bos-

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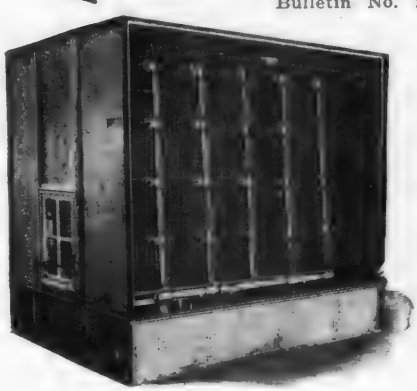

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Canadian Sirocco Co., Ltd., Windsor, Ont., Manufacturers for Canada.

ton; Albert F. Abbott, Medford, and Charles S. Fifield, Manchester, N. H.

Interstate Hydrostat Co., Buffalo, N. Y., capital $200,000, to manufacture heating specialties and boilers. Incorporators: C. B. Sherwood, Buffalo; A. Eckel and W. Eckel, Detroit.

Tillman Heating Devices Co., Indianapolis, Ind., capital $50,000, to manufacture a patented heating device. President, M. D. Tillman, inventor of the apparatus; vice-president, A. C. House; secretary-treasurer, H. A. Thrush. Mr. Tillman was formerly connected with the Honeywell Heating Specialty Co. The new company, which began operations May 1, has taken quarters at 614 Massachusetts Avenue.

George Smith Plumbing & Automobile Metal Co., Springfield, Mass., capital $50,000. Incorporators: George Smith, Jeremiah J. Moynahan and Michael H. Smith, all of Springfield.

Pittsburgh Roofing & Heating Co., Pittsburgh, Pa., capital $10,000. Incorporators: John G. Anderson, Thomas Campbell and Andrew T. Park.

National Heater Co., Cleveland O., capital $100,000, to manufacture heating boilers.

National Valve & Manufacturing Co., Pittsburgh, Pa., capital $75,000, to manufacture pipe, fittings, valve, etc. President, H. E. Haller; treasurer and secretary, J. Lee Rodgers. The company has opened offices at 3101 Liberty Avenue.

Benjamin Plumbing Co., Passaic, N. J., capital $9,000, to conduct a heating and plumbing business. Incorporators: Meyer Benjamin, N. Benjamin, of Passaic, and Levi Samuels, New York.

Williams Bros. Co., Lima, O., capital $10,000, to conduct a heating and plumbing business. The firm was organized by John B. Williams and others.

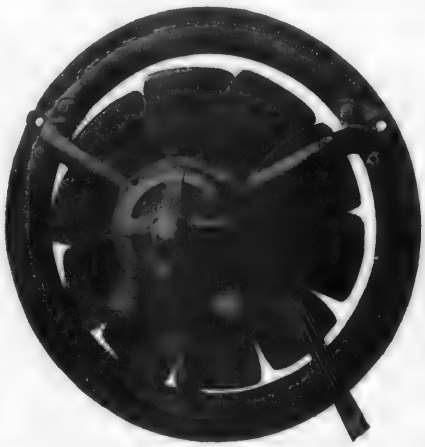
Contracts Awarded.

Leitelt Iron Works, Grand Rapids, Mich., heating new Lexington school building.

A. A. Christensen, Denison, Ia., heating and ventilating Central School Building at Denison, for $5,799. Other bidders were: Kadoch & Buckley, $7,149; B. Grunwald, Omaha, $6,108; J. M. Badley, Carroll, $5,973.

T. P. Riley, Fargo, N. D., heating and plumbing new Sacred Heart Academy for $24,900. The contract is one of the largest let in many years in North Dakota.

Cook & McDonald, Oklahoma City, Okla., heating and ventilating Lakeside and Eugene Field Schools. A hot blast system, costing $7,160, will be installed in the Lakeside school and a furnace system, costing $5,468, in the Eugene Field building.



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High Efficiency—Note the special construction of the fan. This design, together with the high electrical efficiency of the motor, insures the movement of the maximum amount of air for a given amount of power consumed.

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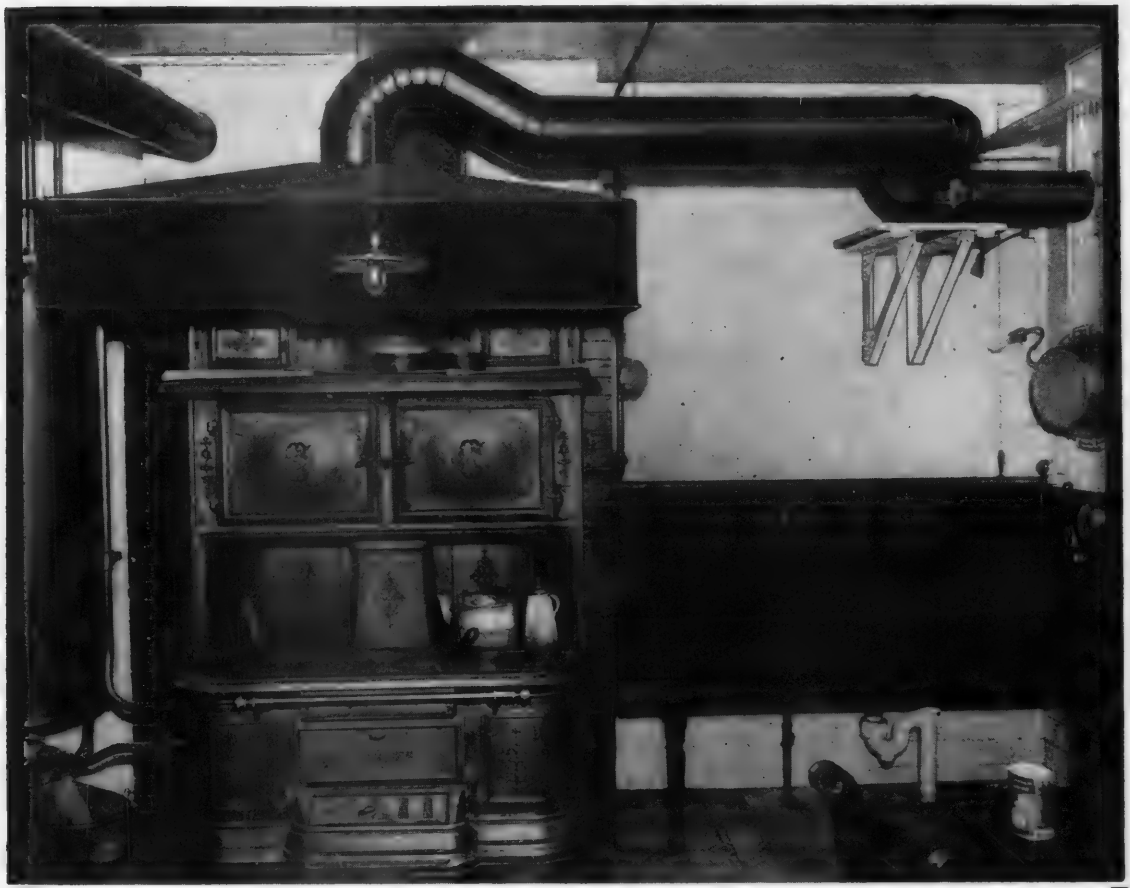

A COOL ODORLESS KITCHEN

In the summer months when the heat from the range and the odors from cooking food make the atmosphere of the kitchen almost unbearable, then will be most appreciated the cool comfort of the

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One of these little sets installed as shown in the illustration quickly draws the steam, odors and hot air from the range through the hood and discharges them out of doors. The fumes and hot air from the kitchen cannot escape to the other parts of the house. The kitchen is kept very nearly as cool as the surrounding atmosphere.

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Alliance, O.—Bids were received as follows by the board of education for the heating and ventilation of the new school building at that place: Lamneck Co., Columbus, new building, $4,969, addition, $1,390; F. E. Geisler & Co., Pittsburgh, Pa., $6,300 (new building); Alliance Hardware Co., Alliance, $5,720 (new building); Samuel A. Esswein Heating & Plumbing Co., Columbus, $6,750 (new building); Huffman-Conklin Co., Columbus, O., $6,583 (new building); Columbus Heating and Ventilating Co., $9,300 (new building), $1,700 (addition).

Bryce Co., Toledo, O., heating and ventilating Union School at Upper Sandusky, for $8,055.

Thomas Heating Co., Racine, Wis., heating and ventilating new school at Arcadia, Wis.

Messner Plumbing Co., Hampton, Ia., heating, ventilating and plumbing new high school building at Hampton for $15,000.

E. Daughtry Plumbing & Heating Co., Bowling Green, Ky., heating and plumbing First Baptist Church at that place for $6,000.

Healey Plumbing & Heating Co., St. Paul, Minn., heating and ventilating the new public library building at St. Paul, Minn., for $34,700; the plumbing contract went to the Kees Domestic Engineering Co., at its bid of $11,499.

A. J. Anderson & Son, Louisville, Ky., steam heating Home for the Aged and Inform at Louisville, for $4,653. The company also submitted a "full" bid of $12,656, covering the work which will eventually be done in completing the heating plant.

John E. Woolley & Son, Evansville, Ind., vacuum steam heating in the new bottling shop of the Evansville Brewing Association, for $7,346; also heating and plumbing plant of the Evansville Carriage Wood Stock Co.

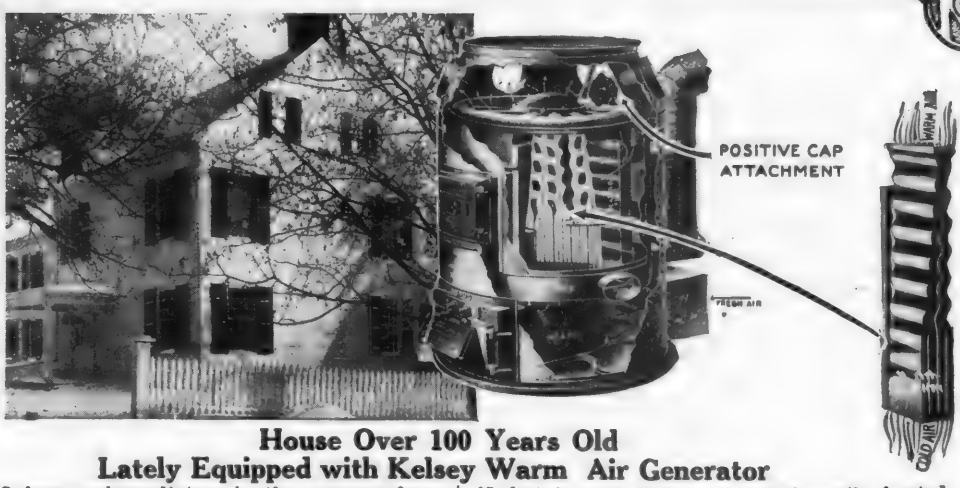
Knee Heating Co., Grand Rapids, Mich., heating new Y. M. C. A. building at Grand Rapids.

J. T. Kerr, Dover, N. J., heating, ventilating and plumbing Keller Avenue School at Dover, for $3,662.

Robbins & Gamewell Co., Pittsfield, Mass., heating Union Block at Dalton, Mass.

Scott Co., San Francisco, Cal., heating California Academy of Science; also heating and ventilating Oriental School.

T. Kewley & Son, Toledo, O., heating and plumbing new Toledo Club building for $40,000.



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CHAPTER III—PIPE LINE DESIGN IN GENERAL

Hot Water System. Steam System. Steam System (Return). Percentage of Line Loss. Map of One-Pipe Steam System. Map of Two-Pipe Steam System. Map of Multiple Water System. Map of Belt Water System. Comparison of Systems. Tunnel and Conduit Construction. Notes on Construction. Notes on Repaving.

CHAPTER IV—RATES IN GENERAL

Temperature Control. Heat Consumption Tables. Heat Pro-Rating Table. Maximum Demand Rate. Fixed Charges; Operating Costs.

CHAPTER V—THE HEATING STATION

Steam Systems. Water Systems. Boilers. Pumps. Reheaters.

CHAPTER VI—OPERATION AND MAINTENANCE

Pressure Required in Heating Mains. Pressure Required in Hot Water Mains. Regulating Flow of Water. Temperature Required in Hot Water Heating Mains. Schedule of Temperatures. Notes on Maintenance. Pipe Line. Station. Traps, Meters, etc. Percentage of First Cost.

CHAPTER VII—MANAGEMENT

Notes in General. New Business Department.

CHAPTER VIII—FRANCHISES

Notes in General. Outline of a Franchise. Steam and Hot Water Franchise. Steam Franchise. Hot Water Franchise.

CHAPTER IX—BUILDING EQUIPMENT IN GENERAL

How to Figure Radiation. Table of B. T. U. Emitted per Square Foot per Hour Through Various Materials. Percentage Curve. Data Sheet. Maps of United States Showing Average and Minimum Temperatures Recorded. Wind Effect. Location of Direct Radiators. Temperature Control. Pipe Covering.

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Knoedler & Meredith, Chattanooga, Tenn., heating and plumbing new dormitory at Martin College, Pulaski, Tenn., for $6,000.

American Heating & Construction Co., Los Angeles, Cal., power plant and vacuum heating system for the Merchants' National Bank building at Los Angeles.

Frank J. Boyer Plumbing & Heating Co., Norristown, Pa., heating and ventilating new James A. Welsh School at that place.

Ross Bros. Plumbing & Heating Co., Edmonton, Alberta, heating, ventilating and plumbing new Arts Building at the University in that city, for $70,000; also heating, ventilating and plumbing new Normal School in Alberta, Canada, for $30,000.

Downey Heating & Supply Co., Milwaukee, Wis., heating County Tuberculosis Hospital at Wauwautosa, near Milwaukee. The Dunham system of heating will be installed.

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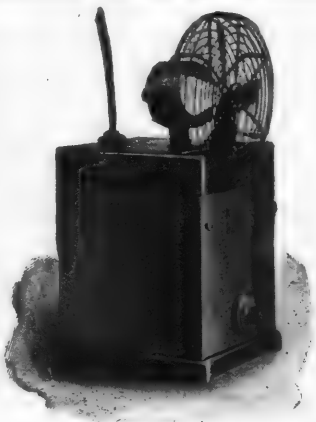

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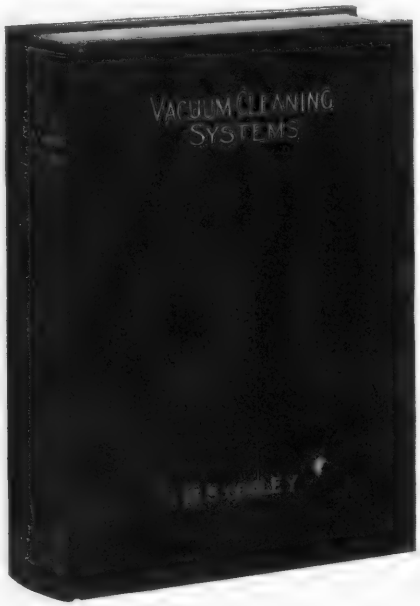

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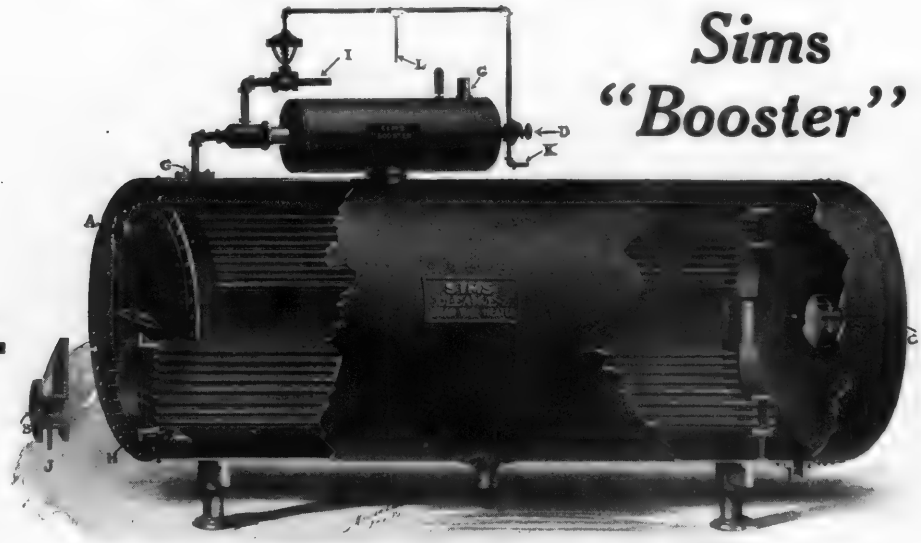

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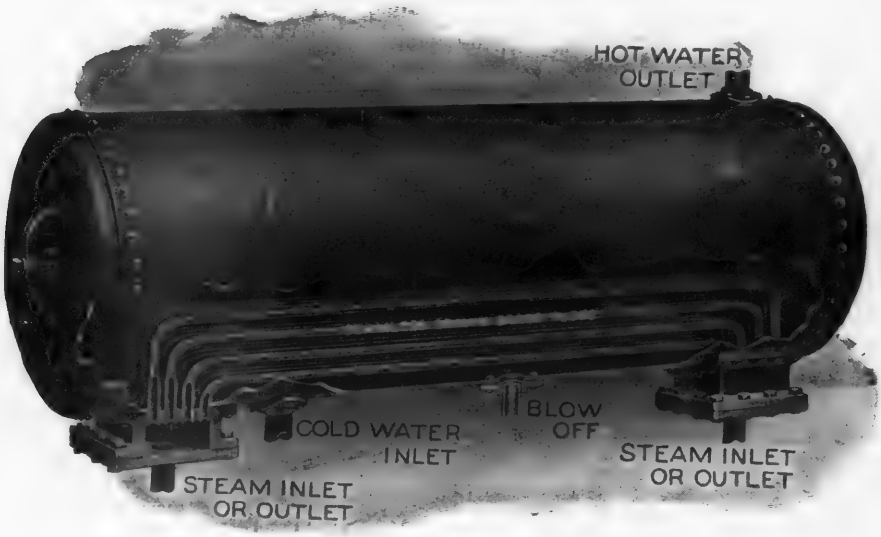

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TYPE C

THERE IS NO IDLE HEATING SURFACE

IN THE

PATTERSON
HOT WATER TANK

for heating water for domestic or manufacturing purposes

When steam enters the **Expansion Chamber,** it expands and uniformly fills the tubes, whose combined cross-sectional area is several times that of the steam pipe. As rapidly as the steam condenses, due to transmitting its heat to the surrounding water, it is discharged into the **Condensation Chamber.**

The Condensation Chamber has sufficient area to provide for any sudden increase of condensation without permitting it to back up into the tubes to destroy their heating efficiency.

The heating surface in the Patterson Tank consists of a number of parallel seamless drawn brass tubes, both ends of each being expanded into heavy cast iron tube-heads with an improved roller expander. Their ⌐¬ shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.

Any combination of storage and heating capacities can be furnished.

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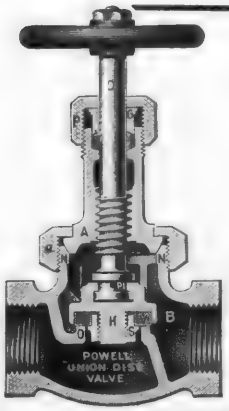

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1. Body symmetrically designed and well-proportioned. 2. Metal distributed to meet most wear 3. Union bevel ground joint connection between body and bonnet, red lead or cement unnecessary to make them tight. 4. Disc-holder "H" permits the use of any make of rubber discs. 5. All parts made to gauge and are interchangeable.

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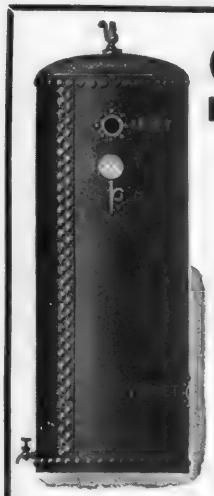

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This heating game isn't a game at all—if you get **started right,** with the **right system.**

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MOLINE SYSTEM
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The Moline people gave him facts, real proof of Moline superiority. They told him straight from the shoulder just why Vapor Heating by the Moline System is the one real warming proposition on the market. Better for users because they get more warmth with less cost; better for the contractor because with it he's got the shade on every competition when it comes to a show-down of quality.

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Send a postal today for the FACTS we've got for you.

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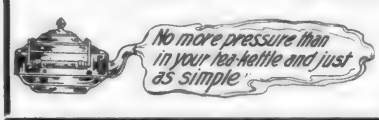

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you will find a half hundred articles written by the best authorities on building management in this country. Here are some of the subjects:

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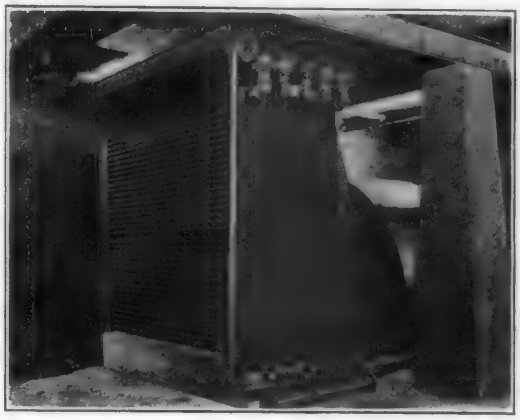
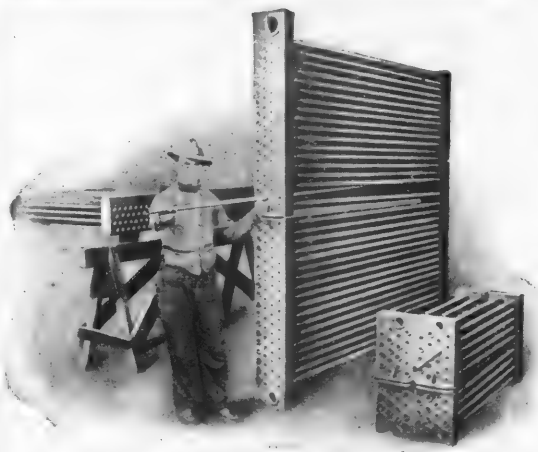
A Beltless Fan
and
A Leakless Heater



Green's New Fan delivers the volumes and pressures required for heating and ventilating and drying work when running at standard motor speeds;—No belts, no gears, no chains, no noise and high efficiency. For factory work, fans running at turbine speeds are supplied, the oil-free exhaust from the turbine passing directly into the heater coils.



Green's Box-Header Type Heater Coils are unique in that each and every pipe is accessible for inspection, cleaning, plugging or removal, without disturbing other pipes. All pipes are straight, without elbows, and can be inspected from end to end or swabbed or scraped out for removal of grease or scale. The flow of air, steam and water is positive and by gravity from inlet to outlet, therefore no water logging and no air binding. These heaters are equally adaptable for the circulation of brine or hot or cold water. Expansion and contraction are fully provided for. Cost of casing is reduced, as two sides are enclosed by the pipe headers, the surfaces of which are smooth, permitting of the direct application of insulating material.

Another advantage of this type of heater is its adaptability for use under low ceilings where the condensate is to drain back to the boiler. It occupies less vertical space for a given amount of surface than does any other type of heater.

The combination of a Green's Fan and Box Header Type Heater represents the top-notch of compactness, efficiency and adaptability.

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Cover a wide range of requirements in all kinds of pressure reductions and regulation, including

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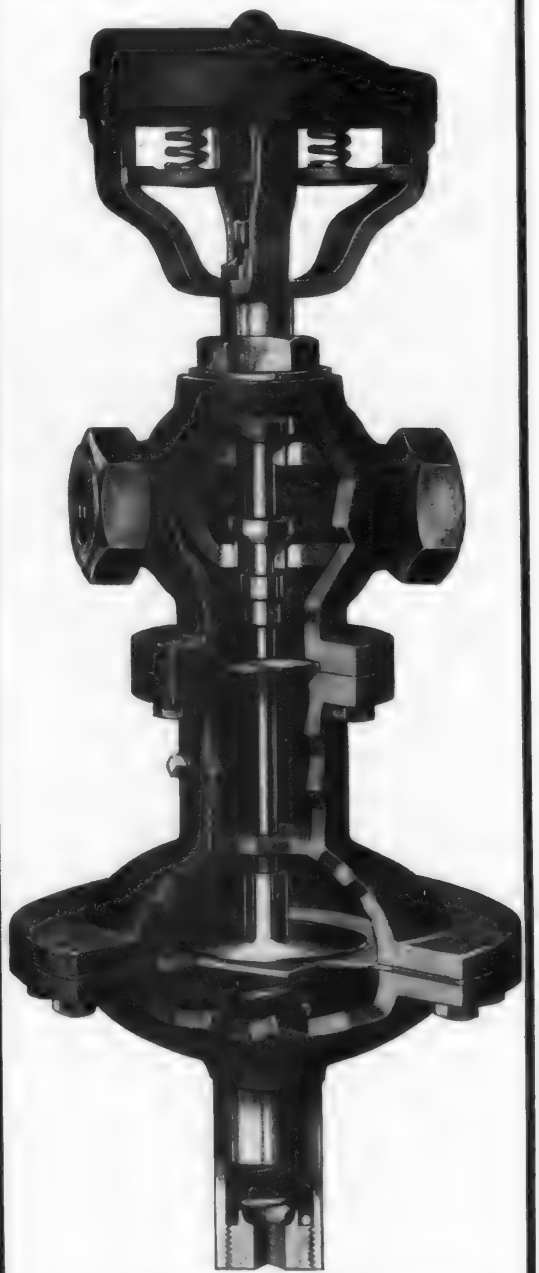

Pressure and Temperature Regulators for either Steam or Hot Water
These Valves are furnished with or without the temperature control. Fully 500 valves in use and not one Failure.

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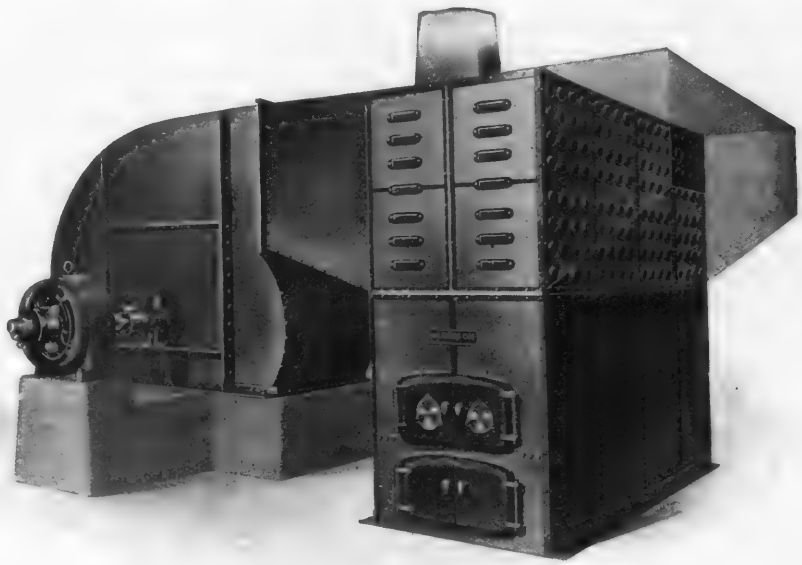

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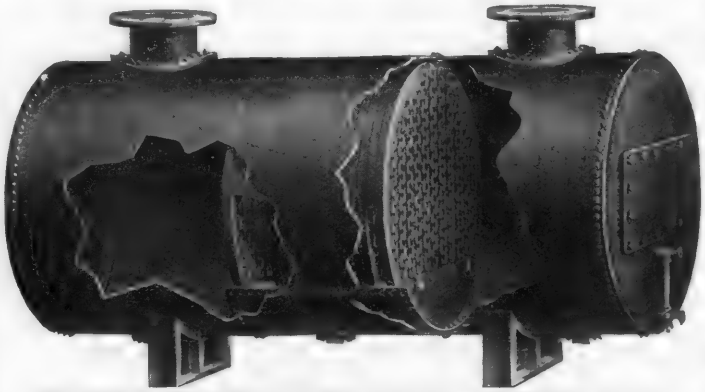
VALUE IN USE UTILITY

Exhaust Muffler and Oil Separator



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A Separator that separates the oil held in suspension.

Absolutely cleans the exhaust, thereby increasing the efficiency of the Heating System, Absorption Machines, Feed Water Heater and Low Pressure Turbines. For use on all vacuum systems of heating.

Keeps the motor valves clean.

All condensation saved either under vacuum or non-condensing conditions.

Is made with Return Tank and Pump Governor; also complete with Feed Water Heater.

Standard Steam Specialty Co.

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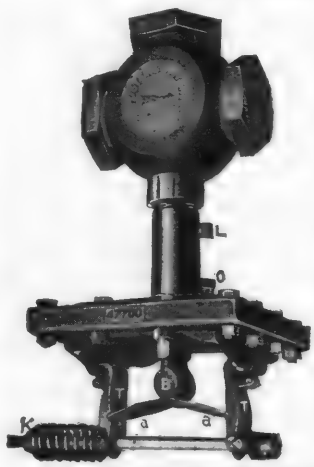
Send for catalogue and reports of chemical tests.

For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

FOR STEAM HEATING SERVICE

(Classes "Q" and "Q H")



lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

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These Valves are fully explained on Pages 29 to 33 of our 1913 Catalogue, No. 20. Please mail copy of Catalogue to

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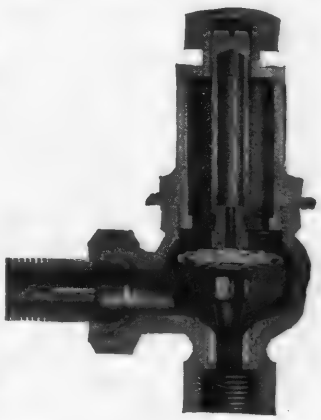
RETURN LINE VALVE

For Low Pressure, Vapor and Vacuum Heating Systems

GUARANTEED FOR FIVE YEARS



Will Not Leak Steam
Most Economical Valve in Use
Sealed Adjustment
Absolutely Noiseless
Shop Adjusted
Easiest to Install

Freely Discharges Air and Water
WITHOUT LOSS OF STEAM

THE Marsh REFLUX Return Line Valve is for use on the return end o radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

Write for literature fully describing this valve

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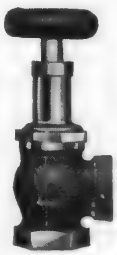
Manufacturers of Gauges for all Pressures and Purposes.
Automatic Air Valves and Steam Specialties.

One Turn Opens and Closes the
SYRACUSE PACKLESS RADIATOR VALVES



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Corner Valve,
with Union

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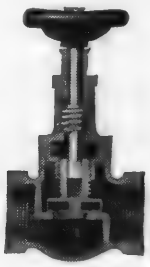

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Standard Globe Valve
for High Pressure

Unexcelled in workmanship, material and design. Made with metal-to-metal joint between top and bonnet, with another leakproof joint around the valve stem. The disc is held in place by a bronze noncorrosive spring, and the tension at all times holds the composition disc against the upper seat, making leakage impossible under all circumstances. The disc holder, which holds the composition disc forming the lower seat in the valve, is spun on the disc carrier in such a way that it may revolve, and allows the carrier to take its seat properly when closed.

The Syracuse Packless Standard Globe Valve is of bronze and is especially adapted for high pressure steam systems.

Send for "Inside Information on The Syracuse Packless Radiator Valve"

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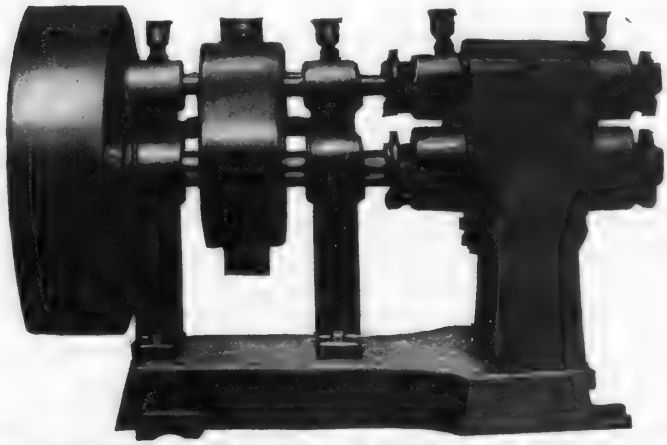

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For Vacuum Heating Systems

These pumps are valveless, have no springs or cams; only two moving parts. Simplest pump on the market. Nothing to get out of order. Inside parts are not in contact; so no wear from friction, also less power required. Results are highest heating efficiency. This Return Line Pump removes the water and air and produces a partial vacuum in radiators. Result is steam filled radiators immediately. Does away with air pockets and cold sections of radiators. No foul air or damage from leaks from air valves, as this is a sealed system. Will pay for itself in short time in saving of fuel. We also manufacture the

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which are built of Monel Metal, and last a lifetime. Get the benefit of our **19 years' experience** in manufacturing Vacuum Pumps, Pressure Blowers, Liquid and Water Pumps. Let our engineers solve your problems.

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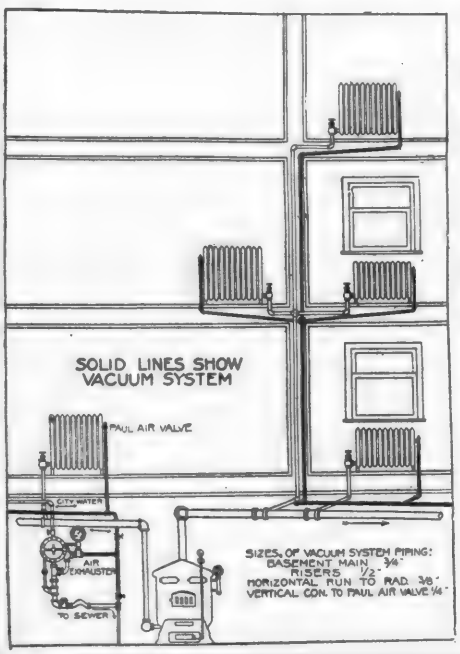


Study this installation. See how the *Leonhard Automatic Water Driven Air Exhauster maintains a vacuum in the air piping leading from the air valves.*

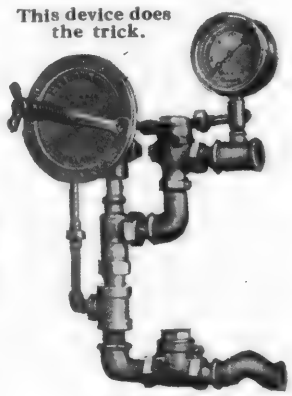
NOTE THE OPERATION

Automatic, Water Driven, Rapid, Silent, Producing Uniform Circulation of Steam

The Air Exhauster has bronze diaphragms, no wearing parts, does not require packing, and will last a lifetime.

It will only cost you two cents to investigate. Write today for new circular.

This device does the trick.



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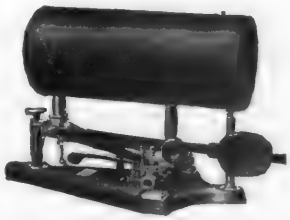

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Morehead Mfg. Co.
Heating Dept.
Detroit, Mich.

Dry Steam

While you cannot **prevent** water in your steam —condensation—you can make it **pay.** A heat unit **saved** is a heat unit **made,** and every heat unit in your plant's condensation can be utilized to an advantage in favor of the coal pile if it is saved and returned to the boiler. The most direct, efficient and economical way to do this is to install the

Morehead
Back to Boiler
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The Morehead System picks up every possible ounce of condensation and returns it directly to the boilers as feed water and at its initial temperature—100 to 150 degrees hotter than pumps can handle it. Does it, too, without pumps or injectors—at a saving of 10 to 30% in fuel. That's the reason it is installed in thousands of the largest plants in the land. **Why not in yours?**

Read the remarkable accomplishments of the Morehead System—learn who the big users are—see some photographs of typical installation—and have our engineers show how conditions can be improved in your plant.

Write us today.

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NATIONAL VALVES

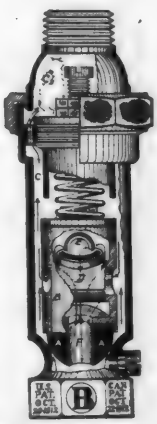
Are Ordered on Their Reputation---Reordered for Their MERIT

Many times you have been told that smaller pipes can be used in connection with Hot Water Heating Systems when they are put under pressure——

But it remained for us to say just how much, as it remained for us to make the B Heat Intensifier a **scientifically accurate appliance** for **increasing the efficiency** of a **Hot Water Heating System.**

Our specially prepared chart, giving full information on pipe sizes and what they should be on installing the B Heat Intensifier, will be gladly sent you on request.

The National Products are in favor because they give added efficiency to every installation. Write for our literature on our "Perfection" Radiator Fitting, B Pipe Joint Compound, Thermostatic Valve, etc., etc., which will be sent you free on your "say so."



NATIONAL STEAM SPECIALTY CO

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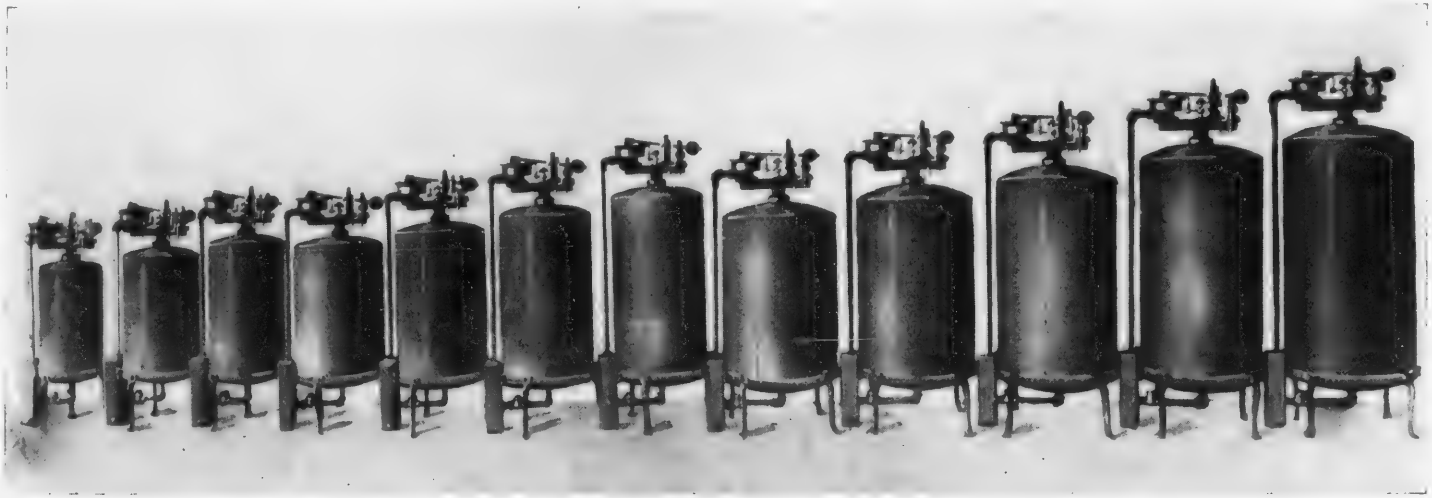
The advantages of vacuum heating have been firmly established in the public and trade minds. The **best** vacuum heating system **is being sought.** You can supply it. For any and every building, large or small, public or domestic.



EFFECTIVE PRESENTMENT OF RANGE OF SPARKS AUTOMATIC VACUUM PUMP CAPACITIES

The Sparks complete line will cover your every heating requirement

The finest treatment of vacuum heating is offered to you, free of cost, in our splendid new book, "The Book of Sparks." Clear descriptions, time saving plans and helpful illustrations and tables—of great interest to the practical man abound in this work of art. Write early as the edition is limited. The Sparks Idea is worth dollars to your business.

Automatic Vacuum Pump Company **442 Wells Street, Chicago**

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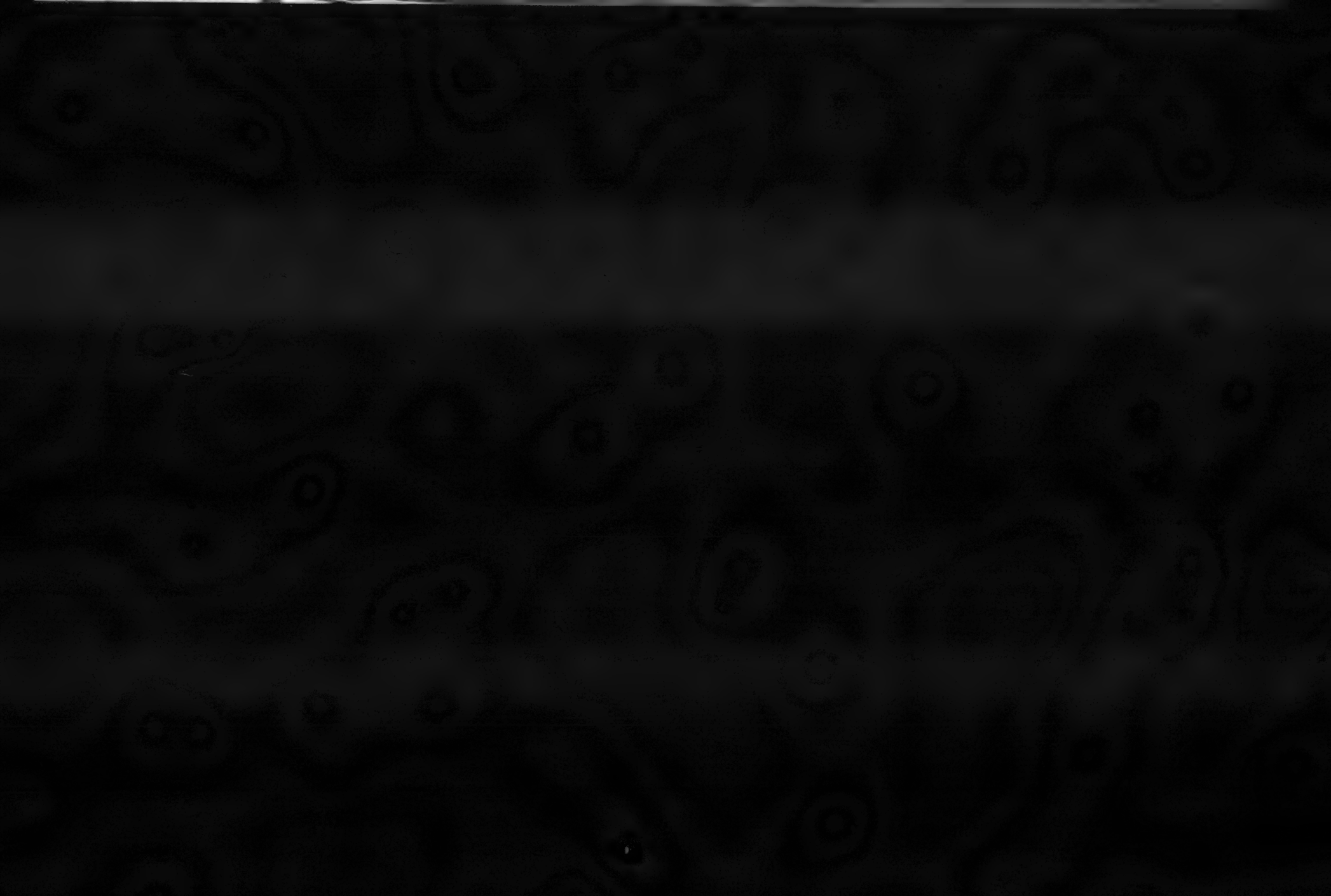
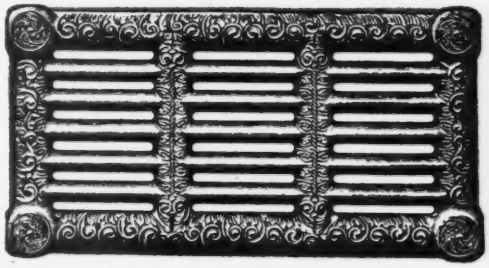


Fowler & Wolfe Wall Radiator Patent Sustained

By the United States Circuit Court of Appeals, Second Circuit, Judges Lacombe, Ward & Rogers.



Extracts From the Decree Handed Down By the Court

"This was a bill in equity filed in the United States District Court for the Southern District of New York, by the Fowler & Wolfe Manufacturing Company against the ..... for an injunction, damages and an accounting for the infringement of Letters Patent No. 609,800, issued to Arthur H. Fowler, of whom the complainant was the assignee for an improvement in radiators.

"The Court below dismissed the bill on the ground that the patent was invalid for the want of patentable novelty and invention, whereupon complainant petitioned for an order allowing an appeal to this Court, which petition was granted.

"The question in this case brings before the Court the validity of complainant's patent, and if the patent is valid, then the question of the defendant's infringement.

"THE DECREE IS REVERSED, with the direction to grant a perpetual injunction as prayed; and that an accounting be had as to claims 1 and 2 of the patent in suit which we hold infringed by the defendant company, and that the complainant recover its costs."

Claims 1 and 2, referred to in the above decision, are interpreted by the court as follows:—

"Claims 1 and 2 relate to the specific construction of the units which are coupled together to form the complete radiator of variable area; and this construction is designed to afford a maximum radiating surface and to give the greatest possible efficiency for a cast iron tubular radiator, both as to internal circulation of air, whether a unit is used alone or in combination with other units. Each unit or section is a casting composed of a multiplicity of communicating tubes, and consists of large outer tubes communicating with one another at the corners, one or more large intermediate cross tubes between the opposite outer tubes, and a series of smaller connecting tubes between the cross-tubes and outer tubes."

Manufacturers, dealers and users are respectfully warned against the manufacture, sale or use of wall radiators that infringe our patents. It is our intention to proceed against all infringers without delay.

Fowler & Wolfe Manufacturing Co.

Originators of Wall Radiation

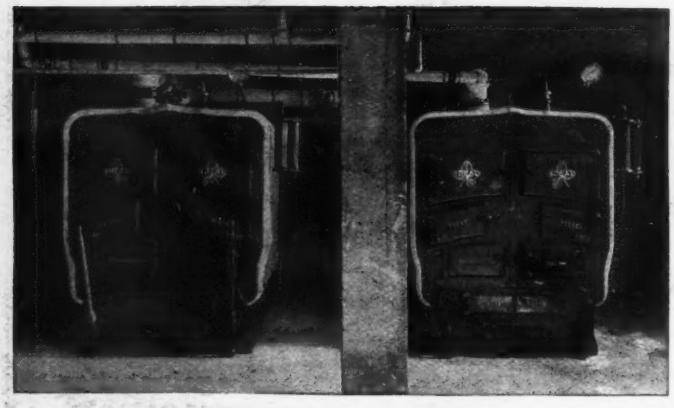
Bourse Building - - - Philadelphia

Cast-iron Sectionals best

A prominent heating contractor who has had large experience with IDEAL Sectional Boilers recently wrote, "I have given the study of boilers very close attention, and I am fully convinced that the cast-iron boiler is far superior. First, because of its economic and efficient consumption of fuel. Second, because of the long life of the cast-iron boiler. Third, because of the small amount of space that the boiler occupies. We have found them quick steamers, responsive to a much smaller amount of fire than any ordinary boiler."

Ideal 48-inch Sectional Boilers

possess all these advantages and many more. Because of their sectional construction they can be easily installed in old buildings or moved if desired without tearing out walls or partitions. Their largest parts will go through an ordinary cellar door. In new buildings they can be installed much easier and with far less expense in handling than the old-fashioned type. Then, too, as another heating contractor wrote, "Experience has demonstrated to us that the life of a cast-iron boiler is unlimited. On the other hand, the life of some boilers is a matter of a few years, varying according to local water conditions, etc., and the care given the boiler." Why not apply the practical experience of these men in your locality, and enjoy the profits of these big boiler sales? Ask for handsomely illustrated catalogue —free.



Battery of IDEAL 48-inch Sectionals in Raymond Hotel, Raymond, Wash. Watson Vernon, Architect, Aberdeen, Wash. Boilers installed by Appling-Griggs Co., Tacoma, Wash. The Boilers successfully burn green, wet slab wood, taken out of the river.

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